INTERNATIONAL PROJECTIONIST

JANUARY 1943

VOLUME 18 • NUMBER 1

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International PROJECTIONIST

With Which is Combined PROJECTION ENGINEERING

Technical Editor, C. F. Alexander

Associate Editor, E. W. Moore

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Monthly Chat

ANOTHER year has begun. The Allied Nations have progressed with increasing momentum during the past year and this year will see the tempo of fighting and production stepped up to a point far beyond that of our enemies. But this will entail real sacrifices by all of us at home as well as on the battlefront. New rationing programs are already on the way—so prepare to pull your belts tighter.

There must be no waste. Each of us must perform his appointed task to the best of his ability with increased conservation and efficiency uppermost in his mind. Only in this way will we achieve our goal: the complete and utter defeat of the Axis powers.

And what of the post war period? Advance planning of the proper type can ease the stress of the period of transition from wartime activity to peacetime stabilization. Our government is already working on such a program—but we, the people, are the final planners. While making all the necessary sacrifices today, we must also aim toward a higher standard of living for the future. We'll need it to buy the many new products ready to be introduced as soon as the war is over. Some have already been developed in connection with war production while others are the result of the research programs carried on by numerous companies.

Let's get behind the New Year and roll it on to victory!

• • •

No doubt the projectionist is aware of the cultural and educational functions of motion pictures, but has it occurred to him that the film is also an instrument of international understanding?

In the December issue of "Educational Screen," Dr. John E. Dugan, one of its associate editors, points out that we are fighting to make possible "the establishment of a sound and lasting foundation for international understanding in a post-war world of peace and reason."

"The motion picture," he states further in his article, "is the most potent agent which has come of age since the last war, and its effectiveness in the field of international relations is almost unlimited. It can jump over the barriers of distance, of time, and of differences in language so easily. Through the manipulation of scenes and of sounds it can be used to arouse almost any emotion, desirable or undesirable, of loyalty or hatred, of courage or fear."

• • •

Deliveries in wartime are uncertain as our transportation systems must give precedence to ever-increasing shipments of military supplies. In view of this fact, we hope that our readers will bear with us in case I.P. is delayed in the mails.

INTERNATIONAL PROJECTIONIST

VOLUME XVIII JANUARY 1943 NUMBER 1

Maintenance of Small Equipment Items

By *LEROY CHADBOURNE*

SWITCHES, tube sockets, common types of volume controls, small rheostats and the like have always been considered comparatively minor items of equipment, not worth too much trouble in maintenance since it was easy and inexpensive to replace.

Now that replacements are not available, however, these parts assume an importance they never had before. Defective parts can stop a show—sometimes for a considerable length of time. They need special attention under present conditions; the more so because they may have been neglected in the past by projectionists who have not had much experience in caring for "minor" items.

Switches must be checked constantly. The knife switch, the toggle switch, the rotary switch and the key switches used in sound circuits all have their own requirements and are cared for accordingly.

The simplest and least troublesome is, of course, the knife switch. However, two precautions are usually necessary, especially the one in connection with knife switches that control power lines carrying inductance (such as the loud speaker field supply line). When such a switch is opened the action of the inductance is to generate a reinforcing voltage, sending a sudden, very heavy surge of current through the circuit. If the switch is opened somewhat slowly the result may be heavy arcing—burning away some of the copper of the switch blades. In a circuit of that kind, the switch should be pulled open as rapidly as possible.

In general it is advisable to avoid scoring or pitting of the switch by any arc-over, however small. The best way to avoid this is to make it a rule never to lay a hand on a switch until perfectly certain which switch is wanted and just what is to be done with it. Hesitation, or a slight mental doubt, just before or in the course of switching, leads to arcing at the switch. Settle the hesitation or doubt, if any, first; then, and not until then, reach for the switch and operate it quickly.

Other Switch Types

Aside from quick operation, knife switches must be kept clean. Dirt of any kind creates an imperfect contact. This leads to minute arcing between blade and clips while the switch is closed, thus pitting the copper and causing an imperfect contact which can only result in still more arcing.

A third precaution with respect to knife switches is to avoid forcing the contact prongs apart in the course of cleaning them. Doing so may weaken their contact tension and, again, lead to pitting. A cloth moistened in carbon tetrachloride can be run between the clips to clean them without exerting any presure that would lessen their tension against the switch blade.

Rotary switches, being spring-operated, are distinctly subject to deterioration. If the blades or contacts become dirty, or if the shaft or spring becomes clogged with old or dirty lubricant, the spring must work against excessive resistance, and in time will lose its power. As soon as one of these switches shows signs of having lost a little of its "snap," open it and remove the cause of the trouble. Clean it if necessary; wash out and replace old lubricant; re-lubricate it; add an extremely thin film of lubricant (vaseline will do) to the blades and contact prongs.

Toggle switches are often so built that they cannot be opened for repairs; they are intended to be replaced when they give trouble. Under present circumstances replacements may not be obtained easily. Depending on the amperage they carry and the kind of circuit they control, they are more or less subject to arcing at their contacts; and being small they are mechanically fragile to a degree. Do not operate them by slapping them with the finger or hand; switch briskly but without any

undue violence. If the correct toggle switch replacement cannot be obtained, a knife switch or some other clumsy and undesirable contrivance may have to be substituted. Plans dispensing with all such switches and controlling the circuit from some other point should be made in advance; or if a given switch is indispensable, plans for replacing it with a knife switch or other device, in case of necessity, should be made in advance.

Key switches of the telephone type present the most serious problem. These often are multi-blade, multi-contact affairs not always easy to obtain in a hurry even when supplies are plentiful; they go wrong in several ways and they can be damaged by well-intentioned acts of maintenance. Moreover, they generally carry weak sound voltages and currents, so that a very slight misfunctioning can cause serious trouble.

They must be kept clean, because very little dirt or corrosion is needed to cause noisy sound. Sometimes their contact points must be filed or sandpapered to remove slight traces of corrosion. There is, however, a decided risk of creating greater trouble in the attempt to cure a lesser one, for careless working at the contacts may weaken or change the prong tension. The clearance in a switch of this type is a matter of a very small fraction of an inch. A slight change in prong tension, or any bending of the prongs, may prevent the switch from closing or prevent it from opening. *Never try to straighten a bent prong or to improve prong tension.* That can be done with a special tool made for the purpose, but in the absence of a suitable tool and experience in using it, any attempt to improve the action of these switches is apt to do more harm than good. In cleaning these switches, use cloth moistened with carbon tetrachloride and exert no pressure on the prongs in doing so. If it proves necessary to use fine sandpaper or a fine nail file on the contacts, exert the nearest thing to zero pressure on the prongs when this is done. And use neither file nor sandpaper until all efforts at simple cleaning have proved ineffective.

Some of these key switches have more prongs and contacts than are actually used. That is to say, the manufacturer of the equipment found it less expensive to take a standard switch from stock than to build one specially for the particular switching job to be done. If one of these switches becomes faulty it is sometimes possible, after making a careful study of the circuits involved, to transfer some wires to unused prongs that are in good working order. Plans for doing this should be studied in advance so that trouble with critically located key switches during a show could be averted. Plans for replacing such switches, wherever possible, with simpler toggle or knife switches, should also be studied in advance.

Jacks built to receive headphone plugs, or meter or other plugs, are often identical in construction to key switches, and everything said above in connection with key switches applies to such jacks also.

Socket Contacts

There are two general types of socket contacts—those that grip the side of the tube prong and those that press against the bottom of the prong. The latter are more likely to cause trouble.

Both types need ordinary cleanliness. One way to clean the side-grip type is to insert and remove the tube several times (with current turned off, of course, to avoid arcing and possible damage). The tube prong may be moistened with carbon tetrachloride before it is inserted. A cloth moistened in carbon tetrachloride may be inserted with the help of a match or a toothpick; but this should be avoided unless it becomes essential, because the contact sometimes consists of a spiral spring into which the prong of the tube fits, and a match or toothpick used carelessly may damage or distort small springs of this kind.

Some procedures for testing tubes and amplifiers involve removing and replacing the tube while current is turned on. Use these tests as sparingly as possible. Never use them unless they are essential; they are rough on sockets.

The type of socket contact that presses against the bottom of the tube prong is subject to loss of tension. If this happens, it no longer presses firmly against the bottom of the prong, and arcing-over may follow, particularly in the case of the filament or heater contacts of large tubes. Often the tension can be improved by removing and bending these contact blades; sometimes by removing and reversing them. Even in cases where they cannot be removed from the socket their tension can be bettered by careful and judicious application of a screwdriver or long-nosed pliers.

Cleanliness is of course a routine essential. The area of electrical contact with the tube prong is fairly small, and very little dirt may cause arcing.

Sometimes the tube prong is at fault in the sense that arcing which has occurred in the past has slightly melted and distorted the solder which forms the bottom of the prong. Be careful about trying to improve this condition by filing the solder smooth—that may make the prong in question so much shorter than the others that proper contact will become difficult or impossible. Also be careful about touching up the condition with a soldering iron. The solder at the bottom of tube prongs forms the connection with the wires that run up internally to the tube elements. In an emergency a fine file, fine sandpaper, or soldering iron may have to be used—with care. It is obviously better to inspect and clean the socket contacts often enough to prevent arcing and thus prevent distortion of the solder tip of the tube prong.

Where arcing has occurred the metal of the socket contact may be burnt, and the coating of oxide thus formed may be a poor conductor, leading to more arcing. Any sign of burning at the point of contact should be removed. The eraser at the end of a pencil will usually do the job satisfactorily, although if the burn is deep it may be necessary to remove the contact from the socket in order to clean it thoroughly.

Rheostats, Etc.

Small rheostats are often used to control exciter lamp current. Small potentiometers are common as volume controls. Faults in these parts can produce a loud noise in the sound, or can stop the sound entirely.

These devices are of two general types. In one the resistance element is a thin plate of composition resistance material, over which a sliding contact can be moved. The other type is the more familiar coil of resistance wire, shaped to a semi-circle, and also contacted by a sliding metal finger.

The composition resistance plates have some tendency to crack. Moving the pointer past a crack produces a loud noise in the speakers. As cracks become more numerous the range of noiseless operation becomes smaller; and ultimately the cracks, responding to any vibration that may be present, produce noisy sound even when the contact is at rest. There is no remedy except replacement.

When a rheostat or potentiometer of composition instruction is installed order a replacement at the first signs of noisy operation. There may be a long delay in obtaining it, but these devices hardly ever break down suddenly. If the replacement is ordered at the first symptoms of deterioration, it should be delivered before the condition becomes too serious.

Composition types should not be opened for adjustment or cleaning. The resistance plate can't stand much handling.

The wire-wound types can be adjusted with reference to contact tension. The

(*Continued on page* 19)

Newton's Rings -- The Yardsticks Of Optical Science†

By *RUDOLPH MILLER*

In the irridescence of an oil film on a wet city pavement and in the colors of a soap bubble in the sunlight, science and industry have the key to the most precise and delicate direct measuring method known.

"It has been observed by others, that transparent Substances, such as Glass, Water, Air, etc., when made very thin by being blown into Plates, do exhibit various Colours, according to their various thinness, although at a greater thickness they appear very clear and colourless." So wrote Sir Isaac Newton in the last quarter of the Seventeenth Century and then he sets about describing a series of experiments in what we now call physical optics which have not been surpassed in ingenuity to date. Considering the crudity of his apparatus, the accuracy of his results is amazing.

The dimensioning of mechanical parts for high grade optical apparatus is very precise. For instance, the lens separations in a modern microscope objective are specified in thousandths of a millimeter, or microns, one of which equals 0.00004". But for gauging optical surfaces on lenses, prisms, and reflectors, the micron, small as it is, is still too large. Here recourse must be taken to fractions of the wavelength of light. The optical engineer assumes and the skilled optical craftsman attains in routine production accuracies of curve to 0.000 006" and can exceed in fineness 0.000 000 8" when instrumental applications require it.

How can optical work be measured confidently with such delicacy? "It's very simple," says the experienced lens grinder and polisher. "I measured it by Newton's Rings and it's within a quarter or a tenth or a thirtieth of a wavelength." In the color phenomena of thin wedge films he has a means for measuring the accuracy of transmitting and reflecting surfaces in units which, though real, are so small as to be almost inconceivable.

Each time such a measurement is made, the classical experiments of Newton are duplicated. This makes it interesting to follow through with the Newtonian explanation as a prelude to the modern explanation.

Newton was not the first to observe the formation of colored areas in the thin film of air between two polished plates, or in thin layers of water as in soap bubbles, or thin plates of glass, mica or pitch. Nor was he the first to propose an explanation. Robert Boyle and Hooke, the microscopist, both preceded him. Neither one, however, provided an explanation on a definite quantitative basis.

FIGURE 1

"To observe more nicely the colours" under controlled conditions, Newton placed the plane surface of a plano-convex objective from a fourteen-foot telescope on the convex surface of a bi-convex objective from a telescope of about fifty-foot focus, thereby forming a thin film of air which gradually increased in thickness from zero. On observing this arrangement by reflected light, at the center where the surfaces were in contact he saw a black circular spot about which was a series of bright and dark concentric circles. In white light the bright rings were colored. In red light the rings were larger than when viewed in blue light. By calculating the distance between the glass surfaces he was able to determine the air film thickness responsible for each color.

Figure 1, taken from "Newton's Opticks," shows the sequence of colors in the bright rings surrounding the central dark spot; a, b, c, d, e: f, g, h, i, k: l, m, n, o, p: q, r, s, t: v, x: y, z, denote the colors in order from the center, black, blue, white, yellow, red: violet, blue, green, yellow, red: purple, blue, green, yellow, red: green, red: greenish blue, reddish white.

Figure 2, from the same source shows the color sequence when the rings are viewed by reflected and transmitted light.

Newton's Calculations

Figure 3 shows the geometry involved in determining the thickness of the air film at any point.

Let r = radius of the colored or black ring

R = radius of curvature of the convex surface

t = thickness of film at distance r from center

then $r^2 = R^2 - (R - t)^2$

$r^2 = R^2 - (R^2 - 2Rt + t^2)$

$r^2 = R^2 - R^2 + 2Rt - t^2$

$r^2 = 2Rt - t^2$

t^2, being small, is ignored

$$\text{therefore } t = \frac{r^2}{2R}$$

In this way Newton calculated the thickness of the air film responsible for the production of each colored ring. He determined the thickness for each dark and bright ring surrounding the central dark area when essentially monochromatic light was used and found that the thickness for each successive ring was greater by a fixed amount.

Thus if the thickness for the first dark ring was t, that of the second was 2t, the third 3t, and so on. From the same data it was evident that the thicknesses corresponding to the bright rings were ½t, 1½t, 2½t.

Combining these quantitative findings

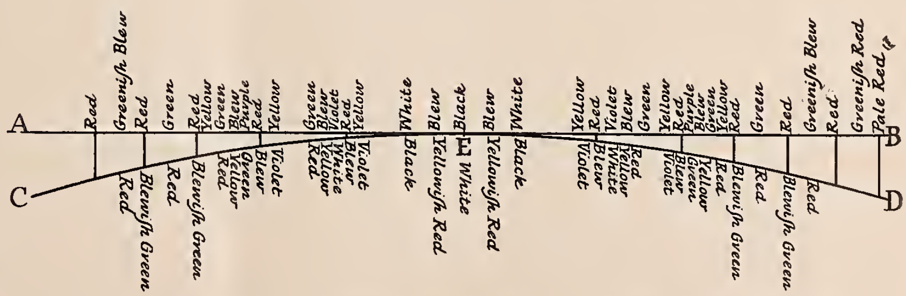

FIGURE 2. *Colors by reflected light above . . . by transmitted light below.*

†Bausch & Lomb Magazine.

with his conception of the nature of light in which he considered it as consisting of actual discrete particles, Newton arrived at the following conclusions covering the formation of colors by thin films or plates. Incidently and unknowingly he also arrived at a very fair approximation of the wavelengths of various colored lights according to modern theory.

Figure 4 summarizes Newton's explanation which follows:

The space between S_1 and S_3 represents a cross section of an air film of varying thickness between two glass surfaces. ddd represent diagrammatically the paths of light corpuscles responsible for the production of a dark ring. bbb represent the paths of light corpuscles

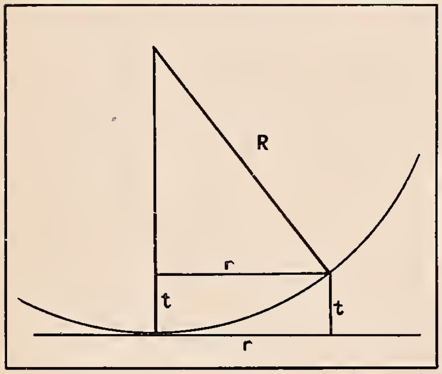

FIGURE 3

responsible for the production of a bright ring. Monochromatic light is assumed.

Light particles proceeding along lines ddd pass from glass to air at surface S_1 and reach surface S_2 in such condition as to be attracted into the glass, consequently they pass on and are not reflected, with the result that a dark area is seen when observed from above as at E_1. A bright area would be seen if observed from E_2. Light particles along lines bbb leave the glass at surface S_1, passing on to surface S_2 where they are in condition to be repelled or reflected. Consequently this area will be seen as bright from position E_1 and conversely dark as seen from E_2.

To explain why the same kind (color) of light particle would be attracted in one case and repelled in another it was necessary for Newton to assume that in the time and distance in passing from surface S_1 to surface S_2 there was a rotation of the particle so as to present it in condition to be attracted or repelled. He considered that the distance between surfaces or film thickness controlled the extent of rotation. This explained the "fits of attraction and repulsion" with which it was necessary for Newton to endow his light corpuscles.

There is a bit of two-edged scientific irony in that Newton's Rings are best explained by a theory of light action which Newton himself opposed, and that the proponents of this theory had difficulty in securing acceptance for it due to the prestige of Newton.

Newton Was Wrong

Ingenious as was Newton's Corpuscular Theory it finally lost ground in the face of the Wave Theory as sponsored by Huygens, Young, and Fresnel.

The modern explanation of Newton's Rings is based upon the assumption that light consists of periodic disturbances which, regardless of their frequency, travel at the same speed in any homogeneous medium.

It can be visualized somewhat imperfectly by the mechanical analogy of water waves which would be formed by touching a tuning fork or vibrating reed to a liquid surface. With such a set-up ripples would radiate in all directions from the point of contact.

If the fork was of low note, fewer waves would be radiated per second than if a higher note fork was used. The distance between the crest of one wave to the crest of the next would be the wavelength in either case. Obviously the low note fork would produce the longer wave. Using two forks of identical vibration rate, it would be possible to find a position where the waves from one fork would dampen out or nullify the waves from the other. Another position could be found where the waves from one fork would accentuate the waves from the other. In the first case, the waves would be out of step or phase. In the second case the waves would be in step or phase.

With light we have a condition somewhat similar. A body giving out visual light radiates energy in wave form, in

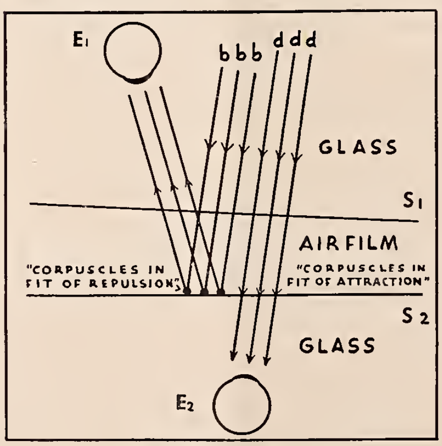

FIGURE 4

which the distance from crest to crest ranges from about 0.000 4 mm to 0.000 8 mm and which travels at the rate of approximately 300,000,000 meters per second in air. It should be noted that interference of light waves emanating from different sources has not been demonstrated experimentally, possibly due to the extremely high frequency making synchronization very unlikely. However, light waves from the same source can be made to interfere under certain conditions, one of which is that responsible for the formation of Newton's Rings.

Let us assume that we have the same experimental arrangement as set up by Newton, namely a convex surface of very long radius and a plane surface enclosing a very thin film of air. Or we can

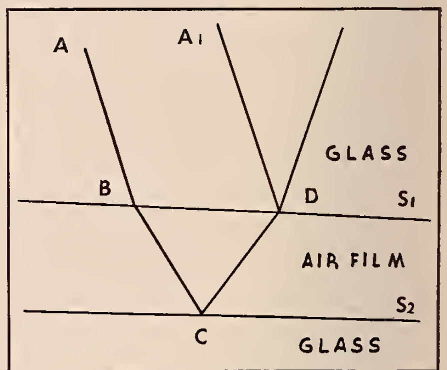

FIGURE 5

substitute for this a B&L Newton's Rings Demonstrator. As an illuminant we will use a source radiating light of one wavelength. On looking at the enclosed air film from above we will see a central dark spot surrounded by alternate bright and dark circles. If we looked through the air film, we would see just the opposite, a central bright round area surrounded by alternate dark and bright circles. Due to the very slight difference in curvature, the air film at any point can be considered as esentially plane parallel. We neglect all reflections except those at the enclosed air film-to-glass surfaces. These conditions are diagrammed in Figure 5.

The Cause of the Rings

A portion of the ray of light coming from A nearly normal to the film is refracted at point B where it leaves the glass on entering the air film to point C where it is reflected back through the film to point D, where it is refracted along the same path as that portion of a ray coming from A1 is reflected at point D.

If the length of the path BCD is such that the light waves in the light following the path BCD are out of step one-half wavelength, they will interfere with or nullify those reflected at point D, and no light would be reflected from the film.

When the length of the path BCD is such that the refracted and reflected portions are in step, they augment each other and increased reflection occurs.

It would seem that the center area, where the glass surfaces are practically

in contact. should appear bright because here the film thickness is very small compared with the wave length, and sufficient lag to cause interference would not occur. The apparent discrepancy is explained as follows: reflection at C occurs in air and there is a lag in the reflected light of ½ wave length. Reflection at D occurs in glass with no retardation. Accordingly, no light is reflected at the center nor when BCD is equal to any whole number of wave lengths.

Taking into account the change of phase on reflection mentioned above, film thicknesses corresponding to odd multiples of ¼ wavelengths will give increased reflection or "bright rings" and those corresponding to even multiples will give decreased reflection or "dark rings."

Heretofore we have considered the conditions for light of only one wavelength. When white light is used, the colors seen are those remaining after interference. They are in the sequence given by Newton and shown in Figure 2. It is interesting that light interference as shown by Newton's Rings also forms the basis of surface treatment of lenses, including projection lenses, to prevent a loss of light by reflection.

From the above it can be seen that in the thickness of an air film the skilled optical worker has a means of extreme delicacy and accuracy for proving his work. It is surpassed by no other precise physical determination. When he checks his work by simply noting the shape, color, and number of rings or bands that appear when he places the work in hand in contact with the master gauge, he can determine differences in curve or flatness in any desired fraction of the wave length of the light employed. By using this test he can arrive at such perfection of surface that molecular cohesion results when two such perfect surfaces are brought together.

It is also safe to say that without such a method the production of modern optical instruments of high precision would be a matter of infinite rarity.

The demonstration of Newton's Rings is usually somewhat unsatisfactory when makeshift apparatus is used. To form rings of sufficient size as to be observable readily without magnification, a convex lens of very long focus must be employed. Such lenses are not commonly available.

Accordingly, the B&L Newton's Rings Demonstrator, here illustrated, was devised. In this a convex surface of approximately 4.240 meters radius opposes a concave surface of approximately 8.480 meters radius. Surfaces are protected from dust by mounting in a zylonite ring. This is not a piece of precision apparatus. It is intended to show the effect of surface deformation by pressure.

Miami Local Acts on Conservation Program

In support of the Conservation program ordered by I. A. President Walsh, the following rules and recommendations have been formulated by the Miami Local 316 Committee on Conservation and Standards. Officers and members of the local have adopted these suggestions unanimously and with patriotic promptness. Local 316 President H. A. Joslin and Business Agent George Raywood urge their members to post these recommendations in their projection rooms.

ALL booths should be cleaned thoroughly at least once a week, and oil or wax applied to keep down dust. Any difficulty in having this done should be reported to Brother Raywood.

Lamphouses, amplifiers, motors, rectifiers, generators, and control cabinets should be cleaned at least once a month with a vacuum cleaner. The Committee recommends that the management supply a cleaner of the Electrolux type—a light cleaner with hose and attachments that may be used both as a cleaner and a blower.

The Committee recommends powdered Bon-Ami or Wonder cleaner paste for cleaning reflectors and port glasses. *Do not use* any of the patented liquid cleaners for this purpose. Projection lenses should receive the most careful attention; the new coated lens should never be taken apart for cleaning. Avoid use of cleaning fluids and clean exterior surfaces with lens tissue.

Do not attempt to mix oils but buy oil of the correct consistency. Use only oil and grease specified by the manufacturer of your equipment, and *do not* oil to excess. *Do not* lubricate your equipment while it is in operation. Keep your oil cans properly covered, and be careful of dirt and foreign matter on the tips of oil cans.

Follow a regular schedule of oiling for all motors, generators, fans, and other rotating equipment and keep a record of this schedule. The fan or blower in G. E. rectifiers should be oiled once a year. *Do not* try to oil the fan in Forest rectifiers.

Intermittent movements should be inspected for the quantity and condition of oil at regular intervals. Add oil of the

(*Continued on page* 21)

Newton's Rings Demonstrator

In The

SPOTLIGHT

By HARRY SHERMAN

WHY do we have to wait until the horse is stolen before we lock the stable? In a few minutes about 500 lives were snuffed out by a fire which swept through the Cocoanut Grove night club in Boston. The New York Times stated, "It needn't have happened." Of course not! There is now a hue and cry all over the country for more stringent fire laws to prevent similar catastrophes. Old fire laws are being dusted off and brought to light, but give the general public time to cool off a bit and these same laws will be put back again on the shelves. In the long run, the real estate owners will have the final say in the matter, and their financial interests will dictate to a large extent just what measures should be taken to prevent another wholesale destruction of human life.

With two men on each shift in every motion picture theatre projection room, and with *two* exits from every projection room, the chances of panic in a theatre would be considerably lessened. Time and again it has been proven that the cool-headed projectionist can, to a great extent, control the excitement arising in a theatre during a fire by keeping the picture going until all the patrons are safely out of the theatre. One projectionist is kept busy running pictures on the screen while the other one is taking necessary precautions to prevent the highly inflammable materials in the projection room from catching fire, thereby endangering the lives of not only the two men in the booth but of further increasing the panic in the theatre. In a a Broadway (New York City) first class house—both price and picture—the projectionists, in order to gain access to the projection room have to climb a ladder leading from the balcony of the theatre. In case of fire or panic in that theatre, you can bet all the tea in China that these men will never get out of the projection room alive.

Do we have to wait until a Cocoanut Grove disaster hits a theatre and many lives are lost before we will have laws enacted that would make it compulsory to have a man stationed at each machine in the projection room? How many exhibitors do you suppose look upon the two-man shift as a measure of safety not only for their patrons but also for their property? NONE! They are too busy devising ways and means of reducing manpower in the projection room and cutting down operating expenses to give much thought to insuring the safety of their patrons and employees. How many of you remember Willis Graham who was burned to death in the projection room of the Paramount Theatre in Provo, Utah? How many of you remember Fred Schmidt who was badly burned at the Convent Theatre in Chicago, Ill.? These men, and many more like them, would not have had such horrible experiences if they had been working a two-man shift.

Christopher Dunphy issued a statement saying that if a fire causes damage heavy enough to close a theatre, it may remain closed for the duration. In many cities throughout the country during the recent holidays, local authorities banned the use of combustible materials in decorating theatre lobbies. However, NOT ONE step was taken to safeguard the lives of the men in the projection rooms. Every State Organization, every District, and every Local in the country should contact their state legislators and convince them of the urgency of enacting the two-man per shift law. Let's not wait until another tragedy shocks the nation and men, women and children are incinerated because of the pressure put on city and state officials by theatre owners whose prime interest seems to be dollars and cents.

● Bill Canavan (former I. A. prexy) hit a double a short while ago, and Pat McGuire (International Projector Corp.) hit a single. For old-timers that's playing ball. Canavan's youngest daughter, Claire Elizabeth, was married to Dr. C. Oliphant, of St. Louis, and ten days later his older daughter, Rose became the mother of a second son. McGuire, too, became a grandfather to a boy, Leland W. Greey.

● At a conspiracy trial recently held in England, the prosecuting counsel gave the following definition of a scab which we found highly interesting:

"A scab is to his trade what a traitor is to his country, and though both may be useful in troublesome times, they are detested by all when peace returns. When help is needed the scab is the last to contribute assistance and the first to grasp the benefit he never labored to secure. He cares only for himself; he secs not beyond the extent of a day, and for a monetary appropriation he would betray friends, family and country. In short, he is a traitor on a small scale, who first sells the journeyman and is afterward sold in turn by his employer, until at last, he is despised by both and deserted by all. He is an enemy to himself, to the present age and to all prosperity."

● Our industry was well represented at the New York State Federation of Labor Legislative conference recently held in Albany, N. Y. The Tenth District was represented by delegates Tom Murtha, Local No. 4, Brooklyn; Sol Scoppa, Local No. 52, New York; Glenn Humphrey, Local No. 337, Utica; Don Rood, Local No. 128, Utica; Mike Mungovan, Local No. 25, Rochester; Arthur Martens, Local No. 650, Westchester County, and Harry Brooks, Local No. 285, Troy.

● *A flash to Chicago Projectionists Local No.* 110! After eight months of negotiations, threats, etc., the Brotherhood of Railway Carmen won salary increases last November for 1900 of its members employed in the plant of the Pullman Standard Car Mfg. Co., of Michigan City, Ind. These increases were granted by the NLRB and is retroactive to April 1, 1942. The Chicago exhibitors who so generously (?) offered you a 2½% increase may be interested in this item.

● Are you a gremlin? We all know that gremlins are mischievious little guys who play all sorts of tricks on our airmen, but there also are many human gremlins. They are not necessarily malicious people—just unthinking and careless. Some of us are gremlins and don't know it; maybe you are one of them. Examine yourself and if the answer is "yes" to these questions, then you surely are a gremlin. Are you a hoarder? Do you drive your car more

than 35 miles per hour? Do you spread rumors? Do you waste fats and grease? Are you consistent in your purchase of war bonds or stamps? Do you make unnecessary purchases? Take stock of yourself and you will soon have the answer.

● We have just received a very interesting letter from our old friend. Merle Chamberlin, chief projectionist at the M-G-M studios in Hollywood, Calif. Among other things he states that 30 members from his local (No. 165, Hollywood) are now in the service, and 15 more, including himself, are slated to don Uncle Sam's khaki very shortly. The remaining members have formed a pool, each man donating one dollar, and with this money the local, from time to time, sends gift packages to the members in the armed forces.

● Marvin M. Manheimer, Local No. 418, Camden, N. J., is now the chief projectionist at Drew Field, Tampa, Fla. Marvin's theatre officer is Lt. Stanley F. Kraft, a concert violinist in private life.

● Thad Barrows, of Local 182, Boston, Mass., advises us that his local is well represented in the armed forces of our country. Up to the present writing the following members are now in the service: Jacob Adams, Francis L. Brink, Herman Costa, Wm. Fallon, Chas. W. Fermoyle, Herman D. Fox, Jos. P. Griffin, George W. Hookailo, Michael Keller, Wm. Driscoll, Walter Katz, Frank Laby, Gordon Lyons, Jr., Jos. Muzzolo, Jr., and Edward P. O'Neil, Jr. Good luck, boys—we're rooting for you.

● We got a belly laugh out of this one: A big city newspaper editor in this country had to check by telephone with a Cockney pilot who figured in the news of the day, for the name of his home town. The editor could not get the name clearly, so in the American newspaper custom he asked the Cockney to spell it. Quickly came this reply: "*E* for 'Erbert, *A* wot 'orses heat, *L* w'ere yer goes w'en yer dies, *I* wot yer sees wive, *N* wot lay an hegg, *G* Gowd bless me!"

● Ed Friedman, former projectionist at the Riviera Theatre, Scranton, Penna., and a member of Scranton Local No. 329, is now stationed at the Great Lakes Training Station.

● Motion picture theatres have definitely been put in the non-essential classification by the Canadian government. As a result of the "no priority" ruling of the powers that be, it will not be possible to obtain replacements of any projection equipment. It is now up to the men in the projection room to take the best possible care of their equipment and to see that the theatres are kept running as long as possible. Although our own WPB ruling is not as severe as that of the Canadians, our boys must do their part in helping to keep the theatres open for the duration.

● Altec's popular Broadway representative, Jerry Littenberg, has enlisted with Uncle Sam's navy, and R. W. Kautzky, an oldtimer in this industry, has taken charge of Jerry's "beat." On behalf of the Broadway projectionists, we extend our best wishes to Jerry; and to you, Kautzky, we roll out the welcome mat. Incidentally, while on the subject, another Altec man, R. J. Belmont, assistant treasurer, has joined the army and is now stationed at Fort Dix, N. J.

● Leonard Raff, son of Al Raff, member of Local 306, New York City, has returned home on furlough after seeing action on the African front. Young Raff is a survivor of the "Joseph Hewes," one of the first transports sunk off Morocco, but his parents did not know of this until they heard the news broadcast over the radio.

● Local No. 356, St. Paul, Minn., has just held its 29th annual election of officers, and we have been advised by Russ Van Vliet, the press secretary, that all officers were unanimously elected. The elected men are: Anthony Lether, president; McPheron, vice-president; Walter J. Palm, secretary; Walter Hoffman, treasurer; James Smithers, assistant treasurer; Leon Crosland, business agent; Gene Holms, sergeant-at-arms, and Robert Jutten, chairman of the executive board. Brothers Wallace, McGlenn, and Ludwig are the other members of the board. After election a collation, which was arranged by Brothers Gates, Helmer, and Jutten, was held for the membership and a good time was had by all.

● Al Criswell, former secretary of Pittsburg, Penna., Local 171, has a new job. He has been certified as a War Production Trainer (whatever that is) by the WPB for the duration.

● The sixth order issued by the WLB since the President's stabilization edict of October 3rd, was that wage increases set by contracts would receive their approval. Individual wage adjustments can be made without approval of the WLB if they fall in certain prescribed limitations. Automatic wage increases are among the adjustments approved. Keep this tip under your hats until the right time for your local to act.

● The Third District (New England) held its annual convention last month in Worcester, Mass. Jimmy Brennan presided at the meeting in his usual calm and efficient manner. I. A. Pres. Richard Walsh and Sec.-Treas. Lou Krouse were in attendance, as was yours truly. At the meeting Thad Barrows, Jimmy O'Brien, Fred Newcomb, Jack Hauser, and John Shay were appointed to serve on a very important committee, the purpose of which cannot be disclosed at this time. Incidentally, INTERNATIONAL PROJECTIONIST was unanimously endorsed at this convention also.

● We also attended the Indiana State Association meeting which was held in Indianapolis several weeks ago. Frank Stickling represented the I. A. office, and the meeting was conducted by Roger Kennedy. Many important matters were discussed, and the subjects of manpower and wage and hour commissions were thoroughly gone over. Arthur Lyday, Local 194, Indianapolis, held his own on all matters brought before the body and proved that he is constantly on his toes where I. A. interests are concerned.

● Albert S. Johnstone, member of Local No. 293, New Orleans, La., has been appointed chief projectionist for the Saenger Circuit. We have known Al for a quarter of a century and take personal pride in his promotion. That he will make an efficient chief is attested to by Harry Rubin, projection supervisor for the Paramount Circuit.

● A new organization has been formed in the state of New Jersey which is trying to "muscle in" on the territory belonging to the I. A. for the past 50 years. These newcomers seem to be of the opinion that they can come into our jurisdiction and commence wielding the "big stick," as it were. They are trying to oust the I. A. projectionists from a certain theatre circuit, but we place our money on the Alliance when it comes to a showdown of strength. Any takers?

● The projectionists and stage hands of Locals 14 and 324, Albany, N. Y., donated their services at a party recently held at the Plaza Theatre in Albany, for the entertainment of men who were about to enter the armed forces. That's showing the proper spirit—if you don't go yourself, you might at least try to ease the burden of the chap who does. He will remember it for a long while.

● Maybe some of you boys would like to know where the Altec service man occasionally disappears to. Well, here is the dope on several of the men: Stan-

(*Continued on page* 20)

Thank you—

INTERNATIONAL ALLIANCE OF THEATRICAL STAGE EMPLOYES AND MOVING PICTURE MACHINE OPERATORS OF THE UNITED STATES AND CANADA, INTERNATIONAL BUILDING, 630 FIFTH AVE., NEW YORK, N. Y.

Affiliated with the American Federation of Labor

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Telephones. Circle 5-4370, 4371, 4372

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New York, N. Y.,

November 27, 1942

To All Members of The I.A.T.S.E.

Dear Sirs and Brothers:

It is a distinct pleasure for me to commend the excellent work being done by Harry Sherman in advancing the interests of the organized projectionist craft. Personally, and thru the pages of INTERNATIONAL PROJECTIONIST, he has constantly exhibited a deep-seated interest in the welfare of the membership of the Alliance.

On a number of occasions of which I have personal knowledge, Harry Sherman has rendered valuable service to many of our Local Unions, often at personal sacrifice; and in the columns of INTERNATIONAL PROJECTIONIST he has consistently pursued a program of benefit to the entire organized craft.

A good craft organ is a valuable asset to any organization, and it seems to me that INTERNATIONAL PROJECTIONIST has earned the support of every member of the Alliance. As a former officer of the I.A.T.S.E., Harry Sherman is well aware of the many problems which confront the organized craft and is at all times ready to be of service.

Good will thus obtained is valuable -- but it is obvious that good will without active support is of little material benefit. I have been informed that many of our Local Unions have cooperated with INTERNATIONAL PROJECTIONIST thru subscribing in bulk their entire membership, thereby translating their good will into more tangible terms.

I would urge, therefore, that wherever possible, Alliance members support the INTERNATIONAL PROJECTIONIST.

Fraternally yours,

Richard F. Walsh
INTERNATIONAL PRESIDENT

RFW:jlr

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random; fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

MANY PROJECTIONISTS are troubled at present because of their inability to obtain the asbestos-covered wire lead used on projection arc lamps. Owing to WPB Limitation Order governing the sale of wire of nearly all types. this wire is impossible to obtain without priority. Bare spots usually occur within the lamphouse, and the heat is such that friction tape, rubber tape, or other common insulation fails to hold up. The insulation that is bad within the lamphouse may be stripped from the wire, which will usually be found in good shape, and Pyrex beads of the proper diameter slipped over the bare wire and threaded on to the wire closely to form the desired insulation. When threaded and held closely together, this forms a perfect insulation from heat and metallic contact and allows maximum flexibility. In lamphouses where the heat does not go too high, it may be found that ordinary glass beads of the proper diameter will do the work.—C. R. SHEPARD, *RCA, Pittsburgh.*

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In 2,000-ft. magazines, it is not easy to raise the reel-end alarm film trolley. Fasten a bracket to the top magazine door near the hinge so it extends above the top edge of the magazine, then a string is attached to it and to the drop-hammer arm on the opposite edge of the magazine and so adjusted in length that when the door is opened the drop will raise the full travel. In this manner, no fumbling past the edge of the full reel is necessary to raise the guide arm when the reel is placed on the top spindle. If the parts are properly located, the string does not catch between the door and the inside edge of the magazine so there is no fire danger. Only 10 inches of string is needed for each magazine.—L. W. LEIDY, *RCA, Cleveland, and* C. H. ATCHISSON, *RCA, Kansas City.*

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I recently had occasion to improvise a stage microphone riser drive motor for remote operation, where the only motor available was a one-quarter horse, split phase, with centrifugal type starting switch. The starting and main winding leads were brought out to a double-pole, double-throw switch to provide for reversal and the operation was quite satisfactory, except that the repeated "inching" of the motor in this particular service proved rather disastrous to the centrifugal switch contacts. This difficulty was overcome by connecting a 75 watt 110 volt lamp across the starting switch contacts. The cold resistance of the Mazda lamp is low enough to assure ample starting torque while the hot resistance is high enough to prevent damage to the starting winding. While I have not had occasion to use this little stunt in an emergency, it appears that it would be a very satisfactory emergency expedient for operation of projector drive motors or motor generators suffering from starting switch ailments.—E. G. HIMENWAY, *ALTEC, Roanoke, Va.*

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On a recent service call inspection of the visual oil level gauges on the MI-1050 soundheads showed the oil level to be even with the line engraved on each gauge glass. However, when one of the soundheads was started, the oil level did not drop as it should normally. Investigation disclosed that the oil gauge nipple had been bent downward, resulting in a false level in the gauge. When the nipple was straightened the true oil level was found to be about 3/16" below the mark, and not high enough to reach the hold-back shaft gear. Soundhead gear box oil level should be checked by observing the change in oil level when the soundhead is started after having been idle for several minutes. If the proper amount of oil is in the compartment, the level will drop about 3/16" when the above test is made.—J. D. STEELY, *RCA, Pittsburgh.*

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Remove and check drive gear shafts for dirt, sludge and other foreign material in oil passageway of shaft. This passageway sometimes becomes clogged. Thus, drive pinion and shaft do not have proper lubrication causing undue wear. —E. E. REIGER, *RCA, Pittsburgh.*

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A small screw top glass bottle such as a mayonnaise jar makes an excellent oil drainage collector for MI-1040 soundheads. Remove left rear motor mounting bolt, poke hole through bottle cap and place bolt in mounting bracket. Screw on bottle, fasten small length of tube on to drainage lip of the MI-1040 oil drainage pan, poke hole in bottle cap and insert lower end of tube. Bottle hangs downward from left rear mounting bolt similar to oil collection bottle of MI-9050-30 soundheads.—S. M. REED, *RCA, Kansas City.*

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Snap switches such as used in W.E. 42, 46, 43, 87 amplifiers, and 706, 708-A and 709 type motor control cabinets, become stiff and do not operate properly after being in use for several years. By applying oil to all moving contacts, and shaft, an apparently worn-out switch will resume full operating capabilities, eliminating need for a replacement.—E. D. VAN DUYNE, *RCA, Philadelphia.*

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In a number of cases, I have found that new tubes and those in service for a short time gave an "open filament" or "burned-out" test on tube checker. These tubes can often be restored to normal operation by heating the filament prongs with a soldering iron, cleaning the filament and leads and inside of filament prongs, then re-soldering. Some tubes will actually give a filament continuity test but will not light due to poor contact.—R. T. BISBEE, *RCA, New York.*

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When purchasing chassis lubricant "S" from a Texaco bulk plant, it was found that with no change in name or designation, this grease can be bought in two forms, one having a consistency of cup grease while the other is stringy. The cup-grease type will not cling to the gears and should be avoided when purchasing this grease.—P. N. CONNET, *RCA, Kansas City.*

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A case was recently encountered where uneven take-up action was corrected by using sandpaper to improve the seating of the fibre disc. This was done by removing the take-up and inserting a circle of sandpaper, cut slightly larger than the friction surfaces, between the fibre disc and the adjoining clutch face. The pulley was then rotated by hand, causing the sandpaper to remove all high spots from the fibre, forming a perfect seat.—J. D. STEELY, *RCA, Pittsburgh.*

I. P. Contestants Solve Tricky Problem

AGAIN American and Canadian projectionists have demonstrated their complete grasp of the problems involved in keeping the show running. The answers to the third question in the "International Projectionists" contest are not only ingenious, but prove that projectionists know the reasons in back of the practical applications of the various types of coupling transformers.

The answers ranged from a general description of the method to be employed to restore sound in case of the failure of a two-winding coupling or interstage transformer to a very detailed and comprehensive paper covering input, two-winding interstage, interstage push-pull, output two-winding, and output push-pull transformers. Not only were there numerous sketches illustrating the methods described, but the theoretical background was also covered. Interesting methods of continuing push-pull operation in case of failure of the secondary of the driver transformer preceding the push-pull tubes, or of the primary of the output transformer succeeding the push-pull tubes were given.

One contestant took issue with us in regard to our comments in the November issue, on his answer to the first contest question. This had to do with the use of electric light bulbs in series across a power supply as a voltage divider. The proposal was to operate the lamps in series, each lamp being operated at approximately 1/10 of its normal voltage. Now the resistance of an electric light bulb does change somewhat with the current through it, depending upon the voltage across it, but for purposes of this discussion the resistance may be assumed to be constant. If, therefore, we apply 1/10 of the voltage across the bulb, a current of approximately 1/10 of the normal value will flow in accordance with Ohm's law. If we by-pass one lamp with a tube heater circuit, as proposed, the resistance of this parallel circuit will be less than that of the lamp above, but the total resistance of the voltage divider circuit will still be greater than if one bulb were removed. It is not to be expected, therefore, that a current of approximately 30 times the normal current, at full voltage on each lamp, may be obtained when the voltage is 1/10 of normal. A different method of approach is to consider what happens when twice the normal voltage is applied to such a lamp. The current may then be considered as doubled and the bulb burns out immediately.

But to return to the answers to the third question. Here again we find that some projectionists have planned in advance for just such an emergency. One has an interstage and a multi-winding transformer. With this combination he feels that he can replace any single tube or push-pull transformer in his sound system. Another has a PA amplifier which he would use—still another has a radio receiver that would be sacrificed. In the words of another contestant he would not hestitate to "dig" into the boss' radio. (We wonder what the boss would say if it should perchance be his pet radio; no names are being mentioned in case the boss should read this.)

One answer raises the question of the ethics, insofar as the contest is concerned, of removing a transformer from an unused audio amplifier in the theatre. This is a very practical solution of the problem and would undoubtedly be used if a suitable transformer were readily available. Here a determination in advance of the suitability of existing transformers for operation in the system would save valuable time in case of failure. This coupled with the development of sure methods for the replacement of any other transformers would pay high dividends in case of an emergency.

In one projection room is hanging a piece of shielded cable thoughtfully provided by a service inspector. In case of the failure of one PEC amplifier, the cable is connected so that both projector sound outputs are connected through the other PEC amplifier and changeover accomplished by exciter lamp switching. Such a connection can be made very rapidly and such advance planning may again pay dividends.

We take the liberty of quoting the following from one of the answers:

"I believe there is much merit in a contest of this kind as it tends to sharpen our wits at a time when we may be called upon to resort to unusual repairs. I can truthfully say that I for

Contest in Wartime Projection
A Test of Skill and Wits

KNOWLEDGE of projection, skill, and resourcefulness in meeting unusual conditions arising out of the war feature this novel contest, which is open to all practicing projectionists. Fancy writing, skill of presentation, win no prizes; prizes are awarded solely on the basis of how well the contestant has met the problem presented. The editorial staff of I.P. are the sole judges, and their decisions are final.

The following prizes are offered *each month:*

First Prize . . . . ***$10.00*** **in War Stamps**

Second and Third Prizes . . . . ***$5.00*** **in War Stamps**

Next Six Best Answers. . One Year's Paid-up Subscription to I.P.

Additionally, at the end of the contest, there will be awarded for the most consistent showing a

Grand Prize . . . . ***A $25.00*** **War Bond**

All answers much reach this office by the tenth day of the month following publication of the question: that is, all answers to January's questions, published below, must reach I.P. by February 10.

Here is the question for January:

You have a two-way speaker system. One or more of the components in the high frequency leg of the dividing network fails and frequencies above crossover are not being reproduced. Because of war conditions you can't get new parts for some weeks. What would you do?

Apply this question to your own equipment, your own projection room. It's your problem, you have to solve it; there'll be no show till it's solved.

For the most ingenious and *practical* solution you win $10.00 in war stamps and a running start toward the Grand Prize $25.00 war bond.

one have become more conscious of our responsibility in making repairs where replacements are hard to get if at all. We in this territory are rather fortunate if we can depend on getting our service inspector here within three or four hours during which time a house full of patrons might become restless."

We are wondering if the above does not express the thoughts of many a projectionist. Indications are that conditions will not improve as time goes on. We all want to "keep the show going" and so plans made in advance of failures reduce show time lost to a minimum. If INTERNATIONAL PROJECTIONIST in its humble capacity can contribute, it is exceedingly grateful.

Maintenance of push-pull operation by means of phase inversion using capacitors and resistors to feed the signal from the plate of one tube to the grid of the other, instead of the conventional invertor tube was proposed by several contestants. The applicability of this method in an emergency is dependent upon the constants having been worked out in advance. If this has not been done, the paralleling of the grids and plates of the push-pull tubes is a quicker and more practical solution. Performance may suffer, but the object is to obtain the best sound as quickly as possible.

Insulating the case of a transformer, having a grounded winding, from the chassis as a temporary expedient was proposed by more than one contestant. One contestant painted such a transformer red presumably as a "hands off" warning. This warning is very important if the winding carrying plate current is the one that is grounded to the case.

Conventional resistance - capacitative coupling was the general proposal as a substitute for defective transformers. If one winding was open, the other winding was to be left in the circuit as a plate or grid load. In a real emergency with suitable resistances lacking, a type of sound might be obtained. But since the impedance of one winding changes when the other winding is open, the removal of the entire transformer and the substitution of proper resistances will give better results wherever possible.

Since so many excellent answers were received the selection of the winners has been exceedingly difficult. Every answer has been carefully reviewed and checked and the winners chosen in relation to the scope and accuracy of the subject matter contained in their answers.

The first prize winner, H. D. Taylor, has proposed emergency substitutes for all types of coupling transformers starting from the photo cell transformers through input, interstage, and to push-pull output transformers. The following quotation from his discussion of a substitute for push-pull transformers is of particular interest:

"A possibility that should not be overlooked would be a coupling transformer of a preceding stage that has split or center tapped windings that could be adapted to push-pull connection and could be replaced more easily with resistance-capacity coupling. Here again valuable material might be borrowed from the monitor amplifier."

Mr. Taylor continues with a very interesting proposal to be used in case of failure of an impedance matching transformer.

"When impedance matching transformers that are used to couple the high impedance of the photo cell output to a low impedance, low level line and to connect the line to a high impedance amplifier input fail, the emergency can be met satisfactorily when the line is not too long, by connecting the high impedances with a low capacity, microphone cable. The cable should be run as short and direct as possible in BX or conduit. The braided shield should be well grounded and serve as the grounded conductor. The cable may be connected to the input grid through a blocking condenser of .005 to .05 mf. The cell will have to be loaded with resistance enough to produce as strong a signal voltage as pos-

sible, and a grid leak high enough to match the line impedance will be needed at the input. The same connection can be used between the volume control (or PEC amplifier) and the main amplifier with better results on account of the higher signal level."

Maurice Rushworth, in qualifying for second prize, has presented a very interesting paper, also covering several types of transformers. He has a Western Electric System with #62-A PEC amplifiers and an 86 main amplifier. The following proposal is applicable in an emergency where transformers have two separate primaries and two separate secondaries:

"The primary of the line to grid transformer (input of the 86A) consist of two windings in series. The primaries and secondaries of the two output transformers in the two #62-A amplifiers (tube to line) also consist of two separate windings in series. If any one of these ten windings open up it would only be necessary to short circuit the faulty winding and continue operation. There would be a little loss in gain if half the primary of the tube to line transformer was shorted and an impedance mismatch if half the 200 winding (secondary) was shorted."

The third prize winner, George J. Beltz, relies mainly on clear sketches for his presentation of solutions involving the several types of transformers. He says in part:

"Any projectionist confronted with a breakdown of a coupling transformer in his amplifier system should consider himself lucky if in anticipation of a situation of this kind, he has on hand the proper size resistors and condensers to make the necessary temporary repair."

Paul Cota is definitely prepared. He says:

"I have provided the theatre with a class AB amplifier and I have it so arranged that I can hook it into the system in 3 minutes and believe me I keep it in A1 working order."

The method of maintenance of push-pull operation proposed by C. H. Perry is very interesting. We have not actually tried out this circuit, but with proper selection of constants a type of sound should be obtainable. We quote that part pertaining to the push-pull output transformer, Perry having assumed a defective primary in the driver transformer. He has already employed resistance-capacity coupling from the plate of the driver tube to the grid of one of the push-pull tubes so that the signal reaches one of the push-pull tubes.

"The plate load of this tube (tube to which driver tube has been coupled) is then shunted with a high resistance potentiometer and from the variable terminal of this potentiometer a portion of the signal intensity is fed to the grid of the other push-pull tube through a suitable condenser. It is advisable to shunt the plate load of the latter tube with a fixed resistance of

(Continued on page 20)

MAINTENANCE OF SMALL EQUIPMENT ITEMS

(*Continued from page* 8)

sliding finger may lose its tension, forming a loose contact which is noisy. This can be corrected by carefully bending the contact until it again presses firmly against the resistance wire. It is usually best to disassemble the device to make this adjustment.

Dirt interposing between the contact finger and the resistance wire may cause imperfect contact. If the unit carries appreciable current arcing or sparking may result, scoring the contact finger and impairing the contact still further. Remove the contact and polish away any pitting that may have appeared.

In some devices of this kind the insulating material on which the resistance wire is wound gives way, over a period of time, particularly when the resistance works hot, as is often the case with exciter lamp rheostats. If the insulating material crumbles or shrinks at all, the resistance coil will not be held firmly, and the sliding finger will not be able to make good contact with it. At the first sign of trouble of this kind, order a replacement.

If the replacement in the case of an exciter lamp rheostat is likely to be long delayed, it is possible to substitute a simple resistor temporarily. Before the device becomes too seriously defective, take an ohmmeter reading to ascertain how much resistance it adds to the line at approximately average setting. A simple resistor of correct ohmage and wattage rating should be much easier to obtain than a replacement rheostat. Such resistors, temporarily substituted for the exciter lamp rheostats, cannot be used to balance the volume output from the two soundheads. It may be necessary to adjust the volume at every changeover. But that is preferable to seriously noisy sound.

In any sound system that has more than one volume control a similar procedure can be followed if the volume control becomes noisy. Ascertain its resistance at average setting by an ohmmeter reading, and replace it with a simple resistor. In most such controls the wattage is negligible, and even a one-half watt resistor would prove adequate. Vary sound volume at the second volume control in the system until the replacement control arrives.

BUY WAR BONDS

A.F.L. ALTERNATE FOR GREEN

Boris Shiskin, economist of the American Federation of Labor, Washington, D. C., has been designated by President Roosevelt as an alternate member of the President's Committee on Fair Employment Practice. He will serve for William Green, A.F.L. president, when it is not possible for the latter to attend meetings of the Committee. John Brophy serves as alternate for Philip Murray, president for the C.I.O.

Mr. Shiskin, co-chairman of the labor policy committee, Office of Price Administration, also serves as consultant to the Federal Housing Authority and the labor production division of the W.P.B.

COPPER MATINEE SUCCESSFUL

"Scrap Matinees," staged by theatres once a month to gather general salvage metal, have now been turned into "copper matinees," to which admission is free to patrons bearing contributions of copper.

Exhibitors responded quickly to an appeal from Chris Dunphy of the WPB by collecting 1,388 pounds of copper during the last week in December, establishing a record high for a seven-day period.

IN THE SPOTLIGHT

(*Continued from page* 13)

ley Meyers, formerly Altec's service man in the West Virginia territory, has accepted a government assignment in the Radio Research Department of the University of California. The new service man in Meyer's former territory is S. K. Brown, who will work in conjunction with J. M. Brandon and J. W. McBurney. Larry Muzzy has been transferred from Pittsburgh to Salt Lake City, while A. W. Alexander has been shifted from Pittsburgh to Memphis.

● Watch the list grow. Film Exchange Workers in Cleveland, Ohio, are now fully organized as Local F-5. We shall note these new additions to the I. A. family as we hear of them—the more the merrier.

● The busiest fellow in Terre Haute, Ind., is Bert Steinhauser, business agent of Local No. 373. He is always ready to do a favor for a fellow member of the I. A., and goes to extremes to accomplish his purpose. Bert is popular not only with his own local membership but with the membership of the state organization, of which he is the secretary. On your next visit to New York, Bert, let's get together for a gab-fest.

I. P. CONTEST

(*Continued from page* 18)

***the same value as the potentiometer to maintain balance. Proper adjustment of the potentiometer is had when the signal intensity across both halves of the primary of the push-pull output transformer is equal and may be determined by running a constant frequency signal through the amplifier and measured with a VI or through a pair of earphones with the D.C. blocked out (a constant frequency may be had by running a loop of unexposed film slightly shifted out of line at the sound gate so as to give partial sprocket hole modulation).*"**

We could continue to present many interesting answers to I. P.'s third contest question, but space does not permit. Let us all sharpen our wits and continue to send an avalanche of answers to future questions.

PIONEER FILM TECHNICIAN DIES

Charles Alvin Ziebarth, 61, secretary of the Bell & Howell Company and an early pioneer in the motion picture equipment field, died November 27 at his home in Wilmette, Ill.

Mr. Ziebarth, whose rich background consisted largely of practical experience in photography and as a film laboratory technician, played an important part in developing manufacturing methods which resulted in the production of motion picture equipment of unequalled precision and reliability.

EASTMAN BUYS $3,500,000 VICTORY BONDS

Eastman Kodak helped Uncle Sam's $9,000,000,000 Victory Loan drive by purchasing $3,500,000 worth of Victory Bonds, thereby becoming the largest single investor in this bond drive in Rochester, N. Y. With this purchase Kodak "appreciably increased its already large holdings of tax saving notes," according to Marion B. Folsom, treasurer of the company.

HARRY STRONG DRAMATIZES USE OF LIGHT

Presenting the subject of light simply and dramatically, Harry Strong of the Strong Electric Corporation, Toledo, Ohio, manufacturers of projection lamps and rectifiers, has dedicated his colorfully illustrated book "Light" to those of us having little or no time for scientific research.

The book, which has been issued in a limited edition, covers almost every phase of light. Among some of the things explained are the photoelectric cell, polarized light, liquid light, the Aurora Borealis, and motion pictures.

In discussing the various uses of light in the modern theatre, Strong explains that "colored light can exert a definite psychological effect on their patrons. Rooms illuminated by blue light seem considerably cooler than is indicated by the thermometer. This 'cold' light produces the illusion of coolness. Yellow or orange, 'warm' light, is responsible for an illusion of higher temperature."

MIAMI LOCAL ACTS ON CONSERVATION PROGRAM

(*Continued from page* 11)

correct grade whenever necessary to maintain the proper level. Intermittent movements should not be drained unless the quality of the oil has deteriorated noticeably. A movement that leaks badly should be overhauled as it endangers the efficiency of your machine.

Check frequently and at frequent intervals the tension on top and lower magazine spindles. This tension should be even and smooth at all times, and extra care should be given to the proper adjustment of the take-up mechanism.

All fire valve rollers and idlers should be checked frequently to see that they are turning freely and not scratching the film as it passes along. Pad rollers or idlers should be adjusted to clear two thicknesses of film.

Every inch of film you handle today is considered critical material, so handle it with more than usual care. Keep it clean and keep it off the floor. Trim damaged sprocket holes, check all supplies, and cut off as little film as possible when making splices. *It is not necessary* to make splices on frame lines. Take care of start and tail leaders. If film is received in damaged condition — bad patches, damaged or torn sprockets, scratched, oily, buckled, improperly waxed—report it at once to the house manager.

Replace and splice securely all Start and Tail leaders on film you are shipping to other theatres. The habit of not replacing such leaders has resulted in criticism. It is a dangerous policy and the local cannot tolerate such practices.

If you must put cue marks on the film, put them in the proper places. On the Standard Release Print, as approved by the I. A. and the S. M. P. E., the change-over marks are to be placed in the upper right-hand corner of four consecutive frames, the first of which shall be sixteen frames from the end of the picture. The Start Motor marks are to be placed in four consecutive frames eleven feet from the first c.o. mark or twelve feet from the end.

Use extra care in making all splices. Scrape the emulsion off well and give the splice time to set. The film cement you are getting now may be lacking in certain ingredients and may not act as well or as quickly as previously. Examine the quality of your splices. Clean your film cement jar at regular intervals and *never* mix different types of cement. Keep your cement can or jar tightly corked. This is a *must*.

Avoid any unnecessary snapping on and off of electrical switches. Check frequently the condition and operation of all switches and fuse blocks for loose connections and bad contacts. Certain types of switches are almost impossible to replace.

Use carbon savers if they are furnished and take care of them as they are costly and hard to replace. Frequent replacement of carbon savers may cost more than the stub you burn. Use two or more savers and alternate their use. Tighten stubs in savers securely but not to tight as to strain the unit; avoid tightening down a stub in a hot saver. Use a *cold* carbon saver each time a stub is burned and you will find that it will last much longer.

Save everything—old fuses, machine parts, carbon drippings and stubs, tubes, bulbs, films, etc. It is necessary for the war effort and to the mutual interest of both owner and projectionist that the fullest measure of value be extracted from each and every item of equipment (consistent, of course, with the quality of the performance which must always be the first consideration).

It is highly important that you follow a daily schedule of thorough inspection, servicing, and checking of your equipment. *Remember*—everything from the shortest carbon stub to the largest projector part, or the smallest screw in the machine is critical material.

EASTMAN FILM CUT NEGLIGIBLE

A 24 per cent cut in output of films for professional use, including motion pictures, will have little or no effect on Eastman production, a company spokesman announced.

"For many months," the Kodak spokesman said, "our film production has been at capacity and there is every reason to believe it will continue to be so. The need for the order arises from the increased film demands of the armed forces and essential industries."

More than two months ago, the company began to ration civilian film to dealers in order to divert more production to military needs. In effect, the WPB order codifies that voluntary rationing.

BUY U. S. WAR BONDS REGULARLY

Winners of the November Contest

First Prize

H. D. TAYLOR
1516 Greenwood Street
Raleigh, N. C.

Second Prize

MAURICE RUSHWORTH
531 S. Longwood Street
Baltimore, Md.

Third Prize

GEORGE J. BELTZ
33 Ninth Street
McMechen, W. Va.

Winners of One-Year Subscriptions to I. P.

PAUL COTA
Palace Theatre
Mason City, Iowa

FRED ERHARD
P. O. Box 1130
El Paso, Tex.

C. H. PERRY
47 Eyre Street
Sudbury, Canada

RUSSELL A. SCHREMPP
Lyric Theatre
St. Louis, Mo.

FRANK SPAINHOWER
P. O. Box 3
Sheridan, Wyo.

MARTIN TEKER
Sheridan, Mont.

Honorable Mention

ED HOWSON
611 S. Maple Street
Watertown, S. Dak.

M. J. NEDERSTEK
2001 Green Street
Allentown, Penna.

H. J. PLEXMAN
409 Murray Street
Sudbury, Canada

GILBERT ROMAR
St. Johns Theatre
Jacksonville, Fla.

WM. J. SCHMULTZ
61 Oakdale Blvd.
Pleasant Ridge, Mich.

JAMES W. TARR
Cozy Theatre
St. Joseph, Mich.

I. A. Ready to Meet Manpower Shortage

RICHARD F. WALSH, I.A.T.S.E. president, announced that the International Alliance stands ready to meet any manpower shortage that a "draft" of labor may create in departments of the film industry under union jurisdiction.

Walsh and Louis Krouse, secretary-treasurer of the I.A., conferred recently in Washington with Paul V. McNutt, of the Manpower Commission, after the latter announced that workers in the exhibition and distribution fields would not be considered essential in any labor draft that might be put into effect. Studio workers in twelve classes, among which are listed production technicians, cameramen, and sound engineers, will be eligible to six months deferments.

It was hinted by Walsh that a labor draft would create a problem not apparent to the proponents of the proposal. He pointed out that it takes from six months to a year to train a person to operate a projection machine properly. Walsh was dubious about the use of women projectionists as a general policy.

FIRE IS CONFINED TO BOOTH

A fire in the projection room of the Muse Theatre in Los Angeles recently was checked without causing undue alarm to patrons.

The fire, caused when a sprocket in the projection machine jammed and a section of the film ignited, destroyed about 1,500 feet of film.

SYNTHETIC AUDIO FREQUENCIES FOR HI-FIDELITY

The ear acts as a translating device and supplies the brain with signal patterns which are, in general, "highly distorted versions of the externally impressed acoustical energy," Louis A. De Rosa, Research Engineer, told radio and sound men from many corners of the country recently at a meeting of the Radio Club of America in Havermyer Hall, Columbia University.

Mr. De Rosa, whose paper was entitled "Synthetic High and Low Audio Frequencies for Hi-Fidelity Reproduction," further pointed out that by understanding the general rules governing the distortion characteristic of the ear, it is possible to supply the hearing mechanism with sounds consisting principally of externally-generated extraneous products and yet produce natural and apparently distortion-free responses. The ear acts as a narrow band transducer, and by applying certain patterns of distortion lying only within the middle range of audio frequencies, it is possible to simulate low and high frequency sensations; this, despite the absence of low and high frequency signals in the sound conveyed to the ear.

One of the many applications of the development is the reproduction of an apparently hi-fidelity signal from a receiver having a poor base and high frequency response.

B. & L. PAYS WAGE DIVIDEND

A wage dividend was paid employees of the Bausch & Lomb Optical Co., Rochester, N. Y. Employees with a year or more service received checks equivalent to a week's pay, while those hired between Jan. 1 and June 30 received a half week's pay.

NEED FOR ALTEC SERVICE GROWS

Growing exhibitor awareness for the need of conservation of critical war materials is reflected in the brisk increase of business to Altec Service which has announced a long list of new service agreements with theatres in various parts of the country.

Altec sound and repair-replacement service will now be used in the six theatres of the Harry Harris Circuit, and in the Alabama and Florida houses of the Fred T. McLendon Circuit. Bert Sanford and L. W. Clung, respectively, represented Altec in the negotiations.

THEATRES MUST SWITCH TO COAL

Plans drafted by the Government require theatres to convert to coal by January 15. Use of oil will be permitted only in cases where theatres are able to present evidence that they cannot switch to coal. Under present plans only houses using 10,000 or more gallons of oil a year will be effected.

A recent ruling has made it possible for motion picture theatre exhibitors in New York, Philadelphia and Boston to apply to local WPB offices for preference ratings which will enable them to get materials needed for the conversion of their heating plants from oil to coal. This will avoid the delay of recourse to Washington which was required previously.

WPB ORDERS FILM CUT 25% OF 1941 CONSUMPTION

An average cut of 25 per cent below the amount of 35 mm. film used by the major motion picture producers and distributors in 1941 was ordered on January 1 by the War Production Board.

The amended order imposes no restriction on the type or content of entertainment pictures which may be made or distributed; it simply curtails the over-all amount of film which may be used by an individual producer or distributor.

Season's Greetings

FROM THE MANUFACTURERS OF Simplex EQUIPMENT

REG. U.S. PAT. OFF.

At a time when our Country is calling for every effort and sacrifice from all of us, we take this opportunity to continue our time honored custom of extending Season's Greetings to our friends of the Motion Picture Industry.

NATIONAL THEATRE SUPPLY COMPANY

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

Simplex

INTERNATIONAL PROJECTOR CORPORATION

INTERNATIONAL PROJECTIONIST

FEBRUARY 1943

VOLUME 18 • NUMBER 2

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Technical Editor, C. F. Alexander

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Monthly Chat

MOTION pictures are being used extensively in the Armed Forces for training purposes. We have all heard rumors of more than one type of training being aided by films. Just recently, however, a new training device was put into production. While no details are at present available, this device is understood to be extremely important and to require the most precise synchronization for proper functioning. Such precision has never been approached in synchronizing sight and sound in the theatre.

The control track principle developed just prior to the War, required more exact recording and reproducing than the then standard single-track film, but even that takes a back seat to what is being done for the prosecution of the War. These technical advances will not be allowed to lapse after the War, but will form the basis for new and probably startling developments in the art. The entertainment value of motion pictures will be increased and there will be a much greater appreciation of their value for educational purposes. In the past, several plans had been made to introduce films into the educational program, but progress was slow. With the impetus given by the success of the current methods in use in the various branches of the service, we may expect these plans to materialize.

• • •

The Federal Treasury is offering this year to people whose 1943 income was $3,000 or less, a simplified income tax form, known as Form 1040-A, which can be filled out in five minutes or less. It may be used by any taxpayer whose $3,000-or-less income came wholly from wages, salaries, dividends, interest and annuities.

With the simplified Form 1040-A there are but six things for the taxpayer to do: (1) write down name, address and occupation; (2) list your dependents; (3) state amount of income received during the year; (4) subtract your credit for dependents; (5) indicate your family status (whether married, single, etc.), and (6) show the amount of tax to be paid, which can be found by reading the table on the tax form.

People whose legal deductions are unusually large would probably pay less tax by using the longer Form 1040, but for most people in the $3,000-and-under bracket, Form 1040-A is not only a timesaver, but a money-saver. Either of these forms may be obtained from your employer or your local Internal Revenue Office.

We suggest to our readers that they file their returns as early as possible, and not to wait for the March 15 deadline. In this way they will not only be helping themselves, but they will be making a real contribution to the smooth working of the nation's tax machinery.

INTERNATIONAL PROJECTIONIST

VOLUME XVIII FEBRUARY 1943 NUMBER 2

Analysis of a Bridging Amplifier

IV.

By *LEROY CHADBOURNE*

Showing how complex diagrams of theatre amplifiers can be analyzed into a large number of simple circuits, each of which can be treated individually.

PREVIOUS articles have discussed various types of amplifiers directly connected with the sound system. In Figure 1 is shown a special type of amplifier, which may be associated with sound systems to operate auxiliaries, such as Cry Room or Lobby speakers and Hearing Aid Attachments. It is commonly known as a bridging amplifier, in that it requires only a very small amount of power at the input terminals to obtain full output power. As such it may be connected across the stage speaker line without appreciable reduction in the power available for the stage speakers. A properly designed amplifier of this type will give excellent quality.

Of particular interest are the input circuit, a method of phase inversion and the push pull output circuit. At the left of Figure 1 are two input circuits, each with its own volume or gain control. When the stage line impedance is from four to fifteen ohms, connections are made to input No. 2. When the line impedance is from 250 to 500 ohms, connections are made to input No. 1. Since, for a given power output, the higher the line impedance the higher the line voltage, we find a series resistor of 0.5 Meg. in the low impedance circuit and a 2.0 Meg resistor in the high impedance circuit. These values have been selected so that the amplifier output will be approximately the same with the same setting of the gain control. An interesting calculation would be the determination of the wattage dissipation in these circuits together with the current flow and the settings of the controls.

Tracing the Signal

Tracing the signal through the coupling capacitor to the upper grid of the 6SC7 and the upper plate of this same tube, we pass through the .02 mf coupling capacitor to the left grid of the upper 6N6-G tube. Connected between this grid and ground are a .25 Meg. resistor and a 10,000 ohm resistor in series. At the junction of these two resistors a connection is made to the lower grid of the 6SC7 tube. Thus phase inversion is obtained. The signal on the upper left grid of the 6N6-G tube is 180° out-of-phase with the signal on the upper left grid of the 6SC7. The signal on the lower grid of the 6SC7 is in phase with that on the upper left grid of the 6N6-G. Since, however, an output signal from a vacuum tube is 180° out-of-phase with the input signal, the signal on the left grid of the lower 6N6-G is 180° out of phase with the signal on the left grid on the upper 6N6-G, as required for push-pull operation.

Thus the twin triode 6SC7 is used both as an amplifier and a phase invertor tube. The .25 Meg. and the 10,000 ohm resistors in series from grid to ground form a voltage divider, the values having been selected so that, considering the plate voltage and plate bias, the signal on the left grid of the lower 6N6-G will be the same in magnitude as that on the left grid of the upper 6N6-G, but 180° out of phase. We thus set up for proper push-pull driving.

The two 6N6-G tubes are twin triodes, the left section acting as a driver for the right section of each tube. It will be noted that the left cathode is connected directly to the right grid in each tube. Likewise, a small bias resistor is connected internally between the right cathode and grid of each tube. We thus have an internal bias on the right grid, the right cathode being connected to ground. A signal on the left grid of either tube modulates the current flowing from its associated plate to cathode by its valve action, and thereby a signal is generated on this cathode. The right grid, being connected to the left cathode, has this signal impressed on it. The plate current flowing through the

primary of the output transformer is modulated by this signal (valve action of the grid again) and thus by transformer action a signal is obtained in the secondary of the output transformer. The principles of push-pull operation are so well known that discussion of them is not necessary here. We thus have two types of twin triodes used in the same amplifier, one as an amplifying and phase invertor tube and the other as a push-pull driver and push-pull power output tube.

The secondary of the output transformer is tapped so that the impedance of different loads may be matched. When the output and load impedances are matched, maximum transfer of power from amplifier to load is obtained and distortion is reduced. The efficiency of the system is then at its maximum and tone quality at its best. In case it is not possible to select a tap on the transformer to match the load impedance, the artificial load shown connected between the output terminals is strapped so that its impedance, in parallel with the load impedance, matches that of one of the taps on the transformer. It is granted that there is some loss of power through the artificial load, but it still presents advantages over a mismatch. Some of you mathematicians may wish to make some calculations along these lines by delving into the formulae for power transfer and power or db loss in the artificial load.

This amplifier also includes a tone control, shown top center, which is actually combined with the power switch shown at the lower left. The circuit consists of a potentiometer in series with .022 mf capacitor. A capacitor of a given size presents an impedance to the passage of a.c. current, this impedance decreasing as the frequency increases. Without the potentiometer in series, the capacitor would by-pass more and more of the signal as the frequency increases and absence of the higher frequencies would rapidly become noticable in the speakers or hearing aids connected to the output. The addition of the potentiometer increases the impedance of the by-pass circuit and reduces the loss of high frequencies. When the slider of the potentiometer is raised to the top, as shown in Figure 1, maximum high frequency response is obtained, as the impedance of the by-pass circuit is a maximum at all frequencies. Conversely, as the slider is moved downward, the impedance of this circuit decreases, the high frequencies fall off more rapidly until, when it is entirely out of the circuit, the sloping characteristic of the capacitor with frequency applies. By changing the values of the capacitor and the potentiometer a wide variation in the characteristics of this by-pass circuit may be obtained.

N. T. S. MANAGER SAVES THEATRE FROM FIRE

Scratch a National Theatre Supply Company manager and you are likely to find a fire fighter underneath. That's what they are saying about "unofficial fire chief" Bill Hutchins, National's branch manager at New Haven, Conn.

Although N. T. S. men know how to get a theatre running again after a fire occurs, Bill Hutchins had the good luck to be on the scene when a fire broke out at the Cheshire Theatre, on the outskirts of Cheshire, Conn. In addition to turning in the fire alarm and using a fire extinguisher on the blaze, Hutchins managed to keep the projection room and all its precious equipment intact. The Cheshire Volunteer Fire Company arrived shortly after the alarm was turned in and soon had the fire under control. The damage was limited to the ladies' room and a badly damaged switchboard.

SLIDES MAKE BIG COME-BACK

Slide manufacturers are reported to be experiencing an unprecedented boom while trailers become scarcer due to government restrictions in raw stock. Large circuits and big first-run houses are using slides to announce special events, and some houses are using them to announce coming attractions.

A majority of theatres have slide projection equipment and those that do not have them are installing the machines as quickly as possible.

According to Lou Semel, head of Cinema-Craft, slide makers, the raw stock order has created almost a new industry within the film business. Regular scene trailers as supplied by National Screen Service are not affected.

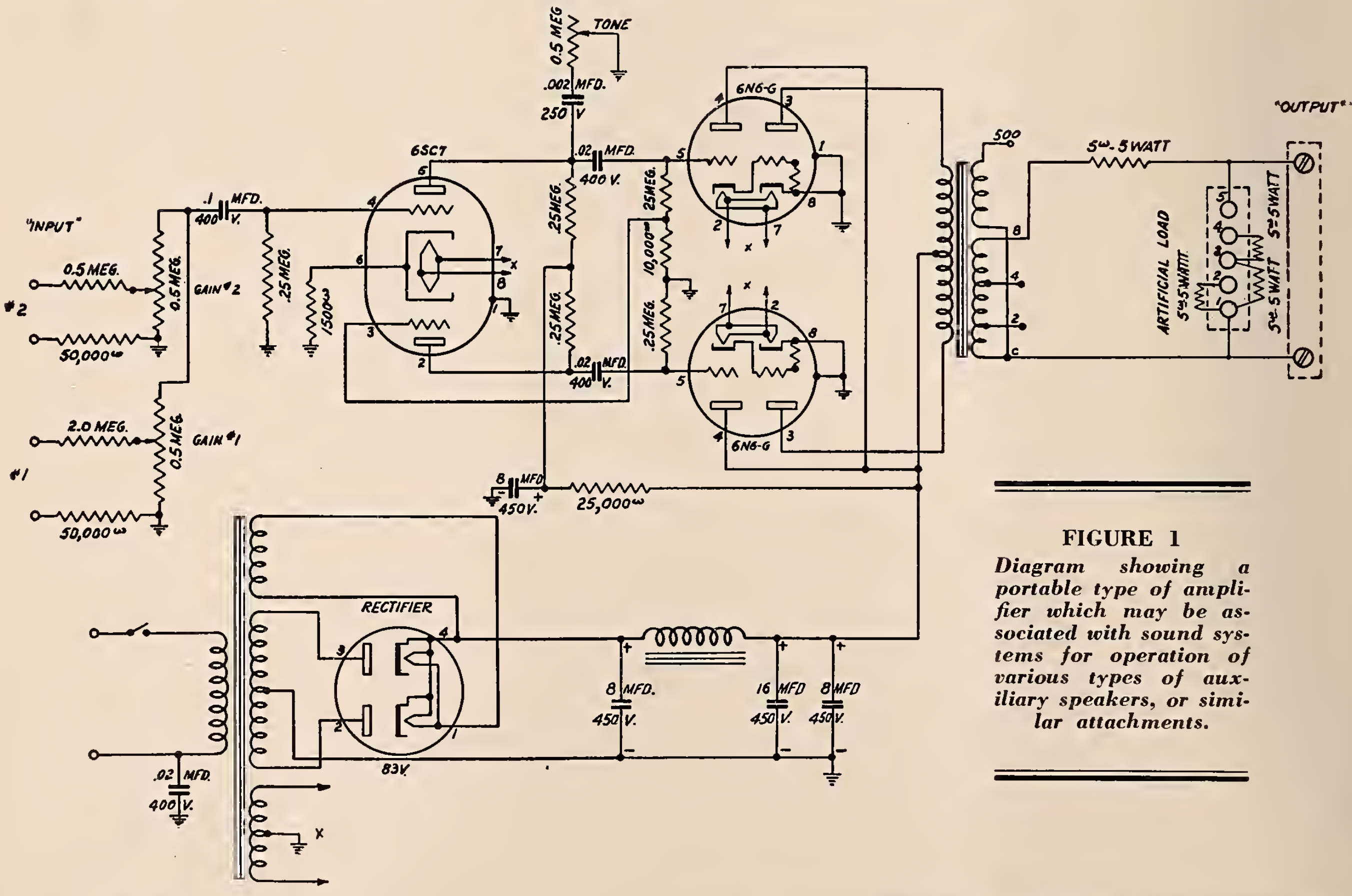


FIGURE 1
Diagram showing a portable type of amplifier which may be associated with sound systems for operation of various types of auxiliary speakers, or similar attachments.

Sound and Projection Equipment in War Department Theatres†

By *GEORGE L. BUB*

The author, who is Chief Sound Engineer of the U. S. Army Motion Picture Service, presents an extremely interesting picture of the growth, performance and services rendered by this organization. From a very humble beginning during World War I, the Service (composed of civilian employees of the War Department) has grown steadily until today it is completely equipping and servicing War Department theatres in posts from the arctic to the tropics. In its early days of existence funds were extremely limited. The War Department was not theatre-minded and the Service had to struggle along for a number of years utilizing equipment salvaged from the demobilization of World War I camps. As time went on, however, funds increased and when World War II began the U. S. Army Motion Picture Service was well equipped to perform its allotted task in admirable fashion.

THIS engineering phase of the U. S. Army Motion Picture Service includes first, the equipment; second, installation; and third, maintenance.

The first War Department Theatres taken over by the Service for the most part contained only one projector. Those having two projectors in many cases had two different makes. Such equipment consisted of Simplex front shutter, Motiograph *1A* table type, and Powers *6A* and *6B* projectors; incandescent a.c. and d.c. arc lamps; transformer, tube rectifier, and gasoline-electric generator power supplies; and from muslin to white plaster wall screens.

The first equipment problem of the Service was to provide each projection room with two projectors of the same make. The abandonment of camps during the demobilization period following World War I created a sufficient surplus of equipment to enable solving this problem. A common storage point to which equipment could be shipped for inspection, and repair where possible, was established in a warehouse at Fort Sam Houston, Texas. This storage space became the first National Repair Shop of the Service. The work of repairing and selecting the best of the equipment, and installing it in the theatres to be operated was completed in 1922. The first stock of parts resulted from the surplus of this equipment.

Following the solving of the first problem came the urge to improve. Being constantly confronted with a condition of extremely limited finances, the engineering staff developed a spirit of ingenious resourcefulness, which led to the highly gratifying result of several of creditable "firsts."

The first satisfactory projection by incandescent lamps on a screen of a size requiring a then modern arc lamp was accomplished in 1923. This improvement was effected by matching more closely the speeds of the light source and projection lens. The first rear-shutter projector was developed as a by-product and placed in use in 1923. The first turntable enabling emphasis of the moods of pictures with appropriate recorded music was placed in use at Fort Warren in December, 1926. The influencing factor here was the inability to provide conventional orchestra accompaniment. The Service was the first to purchase rather than lease sound reproducing equipment; the first to use its own employees to install and to service such equipment. The first open-air theatre projecting sound-motion pictures was placed in operation in 1930 at Fort McClellan, Ala.

The experience gained by installing and maintaining its own equipment caused the Service to embark upon a period of equipment modifications. The purpose here was twofold: simplifying servicing and improving operation. Thus the time spent by engineers on servicing was reduced as was the frequency of regular servicing visits, and there was a material lessening in emergency calls. Over a period of time the results in this connection were that the Service was able gradually to decrease the number of servicings per theatre from twelve to four per year. The decrease in time required of the engineers on servicing increased the time engineers had available for repair work and equipment development at the National Repair Shop, since renamed the Engineering and Maintenance Division. This became an opportunity for the engineers to compare their experiences on difficulties encountered and solutions found in servicing work, thus broadening and developing engineers' analytical ability, and also introducing many improvements and modifications to equipment essential to efficient operation.

Since arc motor-generator sets provide sufficient voltage for dynamic loud speaker fields normally excited by a 110-volt d-c rectifier unit, an emergency switch was provided for use when such a unit failed. Amplifiers were not only required but the circuits revised to improve the gain and response and to include characteristic-warping networks and filters.

Rear-shutter shafts were cut flush with shutter hubs and a lock-plate provided to hold the shutter in time. The lower pins in the rear-shutter housing brackets were locked into the mechanism case to prevent loosening and thereby causing binding in the end bearing of the shutter shaft. Magazine hinges were modified to hold the door in a fixed position to facilitate threading film. An automatic fire-shutter lift-lever was designed and installed on projector mechanisms to lift the fire shutter automatically when the film-trap door was opened.

A USAMPS douser was designed and used on rear-shutter and Super projectors for the purpose of providing an arc beam cut-off blade in the rear-shutter housing to protect the shutter. Projection-lens focusing devices and also rear-shutter timing devices having control knobs accessible in the front covers of projector mechanisms were developed and used.

With the installation of sound equipment, War Department theatres for the first time were able to offer entertainment equivalent to that provided by civilian houses. New patronage was created with the result that the financial status of the Service very shortly was such as to permit purchase and instal-

† *J. Soc. Mot. Pict. Eng.*, Jan. 1943.

lation of the latest types of sound and projection equipment available. From that time on, the Service has been keeping abreast of developments in sound reproduction and motion picture projection, using as guides the recommendations of the Academy of Motion Picture Arts & Sciences and of the Society of Motion Picture Engineers.

Selection of Equipment

Sound and projection equipment is selected not only for the given type and size of theatre but also for its operation and location. To meet the wide range of requirements for the many types and sizes of War Department theatres, the Service uses projectors from portable to *E*-7 types; light-sources from 900-watt incandescent lamps to 125-ampere Suprex types; power-supply units from transformers and tube rectifiers to large motor-generator sets; sound equipment from 5 watts to 60 watts; screens from 8 feet wide to 27 feet wide. Heavier-duty equipment may be used in smaller theatres where both training film and regular motion picture performances are projected throughout every day of the week. In the most isolated locations it is essential for continuous operation to provide stand-by equipment and supplies. The Service must also be prepared to meet not only emergency installations miles from a power line but also situations where either the number of men served or the operation schedules change. In the performance of its mission, the Service found how prophetic were the Chief of Staff's instructions to the Army to the effect that "We must be prepared to operate in the Arctic or in the tropics, in deserts or in mountains . . . ," for motion picture installations have been required in all four of these areas.

The next problem was to coordinate the building completion date, the arrival of equipment, installation engineer, and film program, so as to open the theatre on schedule. The building completion date is, of course, not within the control of the Service. The Service is geared up to supply an engineer on the exact date the building is to be completed, to have all equipment on hand prior thereto, and to commence service on a fixed date. Engineers are scheduled to complete installations of the smaller type of equipment in two or three days, intermediate types in three to five days, and larger types in five to seven days. However, smaller equipments arriving around noon have been placed in operation the same night, and the largest equipments were in operation on the third night following the arrival of the engineer.

Every possible effort is extended to facilitate the installation work. Detailed plans are furnished, which require all wiring to projectors to be brought up through the projector bases. This wiring includes not only circuits to projector motors, arc lamps, pilot, and framing lights, but also douser wiring, exciter-lamp circuits, and sound polarizing and signal circuits. This plan involves drilling holes in the projector bases to permit continuing the circuits through greenfield to individual units of equipment mounted on the bases.

To facilitate checking of circuits, all wires end at a terminal strip. Sound-wiring plans indicate belden-shielded, cambric-insulated, and stranded wires where previous tests and usage indicated their advantages. Thus the difficulties peculiar to the lead-shielded, rubber-insulated and solid conductors in these circuits are avoided. All conduit, wire, and junction boxes, as well as the location and size of the various units of equipment furnished by the Service, are shown on these plans. Despite all these precautions plans are sometimes misinterpreted to the extent that engineers find projection rooms in various stages of completion and conformity with plans from no conduit to beautifully completed jobs.

For example, sound circuits have been found terminated in power panels, sound-head junction boxes have been located near the ceiling, arc-lamps appeared in the ceiling instead of the floor, a few of the runs were dead-ended, 1½" conduit became ½". Probably the most serious error was that where, because of the location of water and sewer lines, it became more advantageous from the contractor's viewpoint to reverse the original plant to shorten the plumbing lines to the washrooms. The contractor, carrying through on the reversal, obligingly located the ports, wall, and floor boxes to operate the equipment from the wrong side. The engineer lost eleven pounds on this installation but opened on schedule. In the belief that the method of indicating electrical work in the usual conventional manner might be responsible for such misinterpretations, a simplier layout plan, showing all four walls and the floor so arranged as to indicate entire conduit runs from start to end, was developed. Recent indications are that the new plan is accomplishing the desired results.

All equipment grounds made at the factory are examined, and in many cases it is found necessary to scrape paint from, or to tin the connecting parts. It has been necessary in some instances to extend the shielding nearer to the lead terminals. During assembly and wiring of the equipment arrangements are made to have the assigned projectionists on hand not only to assist but to be instructed with regard to the equipment, its operation, and its maintenance.

In order to expedite his work the engineer is provided with an installation kit which has been developed for the particular type of equipment being installed. This kit includes special wire, connectors, terminal strips, and other items not usually supplied by contractors to permit planned completion.

Screen Installation

The engineer's next problem is on the stage with the screen, the plans indicating whether it is to be stationary or movable. The stationary types are readily mounted to the back wall or suspended on cables, but the movable types are either hinged to a low ceiling, mounted on tracks or swung on angle-iron brackets up and against the back wall. In the latter method the engineer may find conditions where last-minute changes are made in the building struture or in locating heating and ventilating ducts that require corresponding changes in the details of installing the screen rigging. His main concern, of course, is maximum protection of the screen. However, before installation of the plywood screen border, which is painted to harmonize with the stage except for a black border approximately three per cent of the width of the screen (Figure 1), the projection optical system is aligned so that the centers of the carbon, aperture, and projection lens form a straight line. A pinhole aperture plate is used to adjust the light distribution over the surface of the screen.

(To be continued)

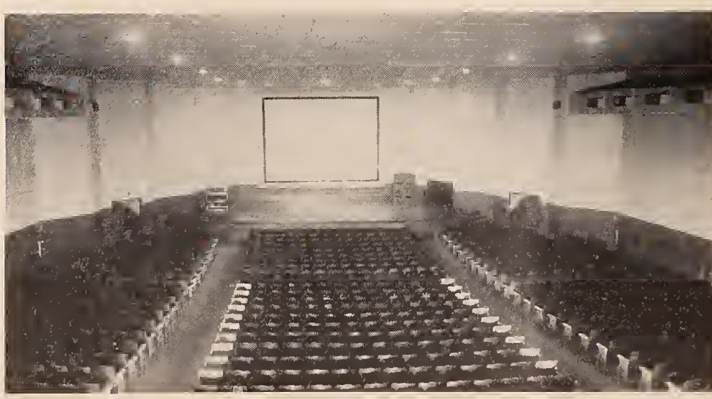


FIGURE 1
Screen installation with black-printed plywood screen border.

IP AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Checking Lost Motion in Gear Boxes of Stabilizer Type Soundheads

Hold main drive gear and rotate motor by hand. Any lost motion is either in the keyway or in the gears themselves. Any excess motion should be checked. If it is a worn gear there naturally is only one solution, but in nine cases out of ten it is loose keys. These keys can be swelled by peening them with a center punch on each side, and then filing them to fit the keyways. Taking this lost motion out makes the head start much more smoothly, and should add considerable life to drive gears and projector mechanisms.—E. A. Doyle, *RCA.*

Emergency Operation of Projector Drive Motors

If the centrifugal starting switch becomes damaged beyond repair, the following method will give more satisfactory performance than attempting to start the motor by hand, and will eliminate the possibility of further damage to the motor while waiting for a new switch. Remove the end bell of the motor and disconnect the wires from the starting switch. Attach a short piece of lamp cord to the wires disconnected from the switch and bring the lamp cord out through the opening in the motor housing. Fasten a bell button switch to the free end of the lamp cord. To start the motor, close the line switch in the usual manner and at the same time press the bell button switch; then release the bell button as soon as the motor comes up to speed. Check the defective starting switch carefully, and if there is any possibility that it might catch in the motor windings or in any other way cause damage, remove it.—W. W. Gilreath, *RCA.*

Noise from Scratched Sound Track Remedy

In many cases where the sound track has been scratched along one edge, some of the projectionists have found it possible to eliminate the resulting noise without introduction of objectionable distortion. With reference to the RCA rotary stabilizer type soundheads, a sheet metal mask is made so that it can be adjusted to cut off the desired edge of the light beam at a point between the optical system and the film.

In order to make the mask, use a piece of paper about one inch wide and five or six inches long. Fold one end back about an inch from the end forming an *L*. The short leg of the *L* is then slipped between the oil pan and the soundhead in such a manner that the long part will drop down through the film opening, and on downward between the front of the optical system and the rotary stabilizer. Cut off at proper length and cut the lower end so that the part which will intercept the light beam is only about an eighth of an inch wide. This will form a pattern from which the sheet metal mask may then be made. After the sheet metal mask is made, carefully shape it so that it will not touch the film and will remain stable without touching the optic. The length of the metal that slips under the oil pan will vary according to conditions, but this can be worked out so that the mask can be easily slid into place and adjusted laterally to cut off either edge of the light beam as the scratched condition requires.—Clifford D. Welch, *RCA.*

Takeup Belt Alarm

An alarm for the takeup belt made similar to the upper magazine reel alarm will notify the operator when he has a broken takeup belt. It will also save film pile-ups in the soundheads and reduce fire hazards. — Frank Hamre, *RCA.*

Emergency Screen Removal

Since my territory covers a part of the Ohio Valley where occasional floods require the removal of sound screens, the following suggestion for their proper removal is passed on with the hope that it may prove helpful. To remove the sound screen, the first consideration is to obtain two of the cardboard which are used inside linoleum rugs for shipment. These tubes are about three or four inches in diameter and are rather stiff and sturdy. They should be placed end to end and then cut off to the proper length to reach from one end of the screen to the other. The joints should be securely fastened together by means of gummed tape, (or similar method), so that no buckling will occur. The lacing is then removed from both sides and bottom of the screen, allowing it to hang free. Lacing cord should be carefully preserved.

Next, place a sheet of white wrapping paper across the entire screen. Place the cardboard tube at the bottom and start the roll, being very careful to avoid any wrinkles. As you approach the edge of the wrapping paper, another piece should be inserted, and so on, until the roll is finished. Insertion of the paper prevents any dirt particles on the back of the screen from being transferred to the front. When the roll is completed, it can be tied about every three feet using strips of cloth 3″ wide, used in such fashion that the roll hangs in the flat surface of the tie. If the water will not reach the roll in this position, it may be left to hang, otherwise the roll may be removed and carried to a place of safety by removal of the top lacing.—C. R. Shepard, *RCA.*

In The

SPOTLIGHT

By ***HARRY SHERMAN***

MANY localities throughout the country have a ruling calling for the revocation of a projectionist's license if it is not renewed within 30 days after its expiration. Should the licensee apply for a renewal *after* the grace period, he faces the prospect of undergoing another stiff examination before it will be issued to him. This ruling is decidedly unfair to those men who are fighting with Uncle Sam's armed forces, and who through no fault of their own are unable to file a renewal application within the specified period. Our men are sacrificing their lives on the various battlefronts so that we may continue to enjoy the American way of life, and they should not be penalized by making it difficult for them to go back to their jobs when the war is over. The I. A. guarantees the union dues of every member in the service, and it also guarantees him the return of his job. We believe that all local unions should act AT ONCE in bringing this matter to the attention of their city officials. and necessary steps should be taken to safeguard the working licenses of their members in service.

State Senator Oliver, of Rochester. New York, introduced a bill in Albany for such a measure, and we sincerely hope the new legislature up there will pass it without any ramifications. Now will somebody please introduce a bill for two-man operation in the projection room —as a measure of protection for motion picture theatre patrons as well as for the projectionists themselves.

● Charles Beckman, financial secretary for Local 306, New York City, has fully recovered from his recent serious illness. You have our best wishes for your continued good health, Charlie.

● A circuit court judge in Kenosha, Wisconsin, recently ruled that a union man could not become a member of that city's Board of Education. An appeal was made to the Supreme Court and the decision of the lower court was overruled. Today Kenosha, Wisconsin has TWO union men on its Board of Education. Some judge, eh?

● Wallace Yutzy has been granted a leave of absence as business agent of Minneapolis Local No 219. Yutzy has gone naval for the duration, and if he will be good enough to forward his mailing address to us, we in turn will pass it on to P. A. McGuire (advertising manager for International Projector Corp.) who is very anxious to get in touch with him.

● The decision to place the newsreels in the essential class was made by the manpower commission in a report to General Hershey of the Selective Service Board. The commission acted on the recommendation of a sub-committee, pointing out the morale value of the newsreel as a medium of communication. This automatically places cameramen. editors, laboratory technicians, sound men and technical assistants in the essential class. BUT WHAT ABOUT THE MEN WHO PROJECT THESE NEWSREELS TO THE PUBLIC? The projectionists are a "medium of communication" to the public, and as such are as important as any of the aforementioned workers.

● For many years William S. Newell, president of the South Portland Shipbuilding Corporation, South Portland, Maine, bitterly opposed the inroads made by legitimate labor unions. Not even the so-called "company unions" met with his approval. However. Mr. Newell seems to have undergone a change of heart, and has become a staunch supporter of organized labor. "*I am now fully of the opinion that properly operated, the union shop is the finest thing for labor and capital. Successful work is the product of cooperation, and that, in my opinion calls for the 100% organization of employees,*" said Mr. Newell recently. This change of heart was brought about not by a miracle, but by intelligent and cooperative dealings with bona fide labor union leaders with whom he came in contact.

Harry Sherman

● The National Theatre Supply Company, under the leadership of its president, Walter Greene, has collected over 7500 pounds of copper for the government in its recent copper drive. Through authorized sales to scrap dealers. N.T.S. is donating the proceeds to the United Nations Fund, Red Cross, USO, and other charitable organizations. When informed of this Chris Dunphy commented, "It is cooperation of this kind that makes a worthwhile contribution towards the prosecution of the war."

● Local 173, Toronto, Ont., Canada. has amalgamated with the National Union of Theatre Employees and has accorded its members full membership in Local 173. This merger ends all strife in Toronto. making that city 100% I. A. organized. Although we have known for some time of the negotiations between the two rival organizations, we felt it was for the best interests of all concerned not to make mention of the pending merger until it had been consummated. We should like to see similar amalgamations in other cities where such conditions exist.

● Tom Canavan, chief of Altec service in St. Louis. Mo., member of the I.A., and a brother of former I.A. prexy Bill Canavan, has been elected an officer of the St. Louis Variety Club. Tom, an inveterate cigar smoker, holds the record for being the best dressed of the Canavan clan.

● Hats off to Ernest Patrick, member of Local 414, Wichita. Kansas, for his coolheadedness in averting a panic when a fire broke out in the Palace Theatre where he is employed as a projectionist. Despite the fire in the theatre, Patrick remained at his post in the projection room and continued with the show until the theatre was cleared of all patrons.

● Although the freezing of wages went into effect last October, the NWLB has granted wage increases to a number of unions. The NWLB approved an ar-

bitration award last month (Jan. 1943) granting an increase of 14.5c an hour to 1700 trainmen and bus operators employed by the Pittsburgh Motor Coach Company. We suggest that a record be kept by local union officials of these increases, so that they may be referred to when needed.

● It looks as though the proposed merger between the AFL-CIO will not take place for quite a while, if ever. There are tremendous problems involved, in addition to a few personal ambitions to be considered.

● Clyde Cooley, secretary of Local 343, Omaha, Nebr., and secretary-treasurer of the Nebraska State Association, is organizing the Film Exchange Local No. F-47. When Cooley finishes the job, you can bet your shirt it will be a job well done.

● No, you cannot change a leopard's spots. In a recent talk before the War Activities Committee in Boston, Mass.. our very good friend, Harry Brandt, who although he employs union men in his theatres is still the best labor-baiter in this country, made the following statement:

"The new manpower survey is going to watch you closely and bear down on the places where nine operators are in a booth which three could operate, or a place where there are no stage shows but rules require stage hands, as always."

Poor Harry, he is still riled at the thought that he has to pay decent wages to *some* of his employees, and would like nothing better than to break down both salaries and manpower wherever he can. He never misses an opportunity to get in his "licks"—even though he generally winds up second best. There is nothing so pathetic as a frustrated labor baiter.

● Lester B. Isaac, Director of Projection and Sound for Loew's, Inc., was presented with an honorary gold membership card in the 25-30 Club (New York City) at the January meeting. The presentation was witnessed by over one hundred members, who warmly applauded Lester's brief but very fine speech of acceptance. He now joins the ranks of the other 25-30 honorary members, namely, P. A. McGuire, Wm. Kunzman, James Lynette and Bart Greene. We are proud to have you in our midst, Lester.

● When addressing a meeting of the S. M. P. E. Atlantic Coast Section several months ago, R. B. Murray, Director, U. S. Army Motion Picture Service, stated that many of the motion picture projectionists then employed in army camps had never seen a projection machine before entering the service. Since then, we have been reliably informed, the U. S. Army Motion Picture Service has not only gone on record as placing these jobs in the hands of experienced and capable projectionists, but has actually cooperated with officials of many local unions in placing their drafted members as camp projectionists.

● Local 626, Nashville, Tenn., has voted to purchase war savings bonds with all local funds that are left over after monthly bills have been paid. To date, Local 626 has already purchased $10,000 worth of bonds—not bad going for a small local. Credit for this worthy plan should go to Messrs. Brown and Waggoner, secretary and business agent, respectively.

● George Lyday, Local 194, Indianapolis, Ind., is in the thick of fighting with the Allied forces in Africa. When last heard from, he came through the first assaults without a scratch, but he was still in a hot spot being in command of a certain sector that the ratzis were anxious to regain.

● That we are right in our contention that the manpower shortage does not affect our craft, except where "peanut salaries" are the factor, is borne out by a statement made by Lt. Col. George A. Irwin at a recent meeting of the Manufacturers' Association. Lt. Col. Irwin, who acts as liaison officer in the states of Illinois, Indiana and Wisconsin for the Selective Service Bureau in Washington, stated "The main drain on employees was not the selective service, but the higher wages in war industry which took a greater number of men from civilian life." This puts another spike in the arguments of those chiseling exhibitors who are always on the alert for an opportunity to cut both manpower and salaries in their theatres.

● Alonzo Bennett, secretary-treasurer for Local 521, Long Beach, Calif., advises us that two more of his members, Milton M. Heiss and Dwight L. Moore, have answered the call of Uncle Sam. Our best wishes to you.

● I. A. local unions throughout the country have purchased over $1,000,000 worth of war savings bonds. This figure does not include the bonds and stamps purchased by the individual members. To the best of our knowledge, Local 199, Detroit, Mich., leads all other locals with its purchase to date of war savings bonds amounting to $58,000; Local 306, New York City, runs second with $50,000 invested in war savings bonds.

● Wherever and whenever possible projectionists should very carefully examine all prints delivered from the exchanges. Many complaints have been made by the exchanges on the condition of film returned to them; some of these complaints are justified. Many of the complaints may be placed squarely upon the shoulders of the theatre manager or exhibitor, as the case may be, who refuses to replace worn or damaged parts of the projection machine until there is a complete breakdown of the equipment. We hold no brief for the shortsighted manager or exhibitor who is so intent upon pinching pennies that he completely overlooks

(*Continued on page* 19)

Dear Mr. Sherman:

It was with great interest that I read the item that appeared in your "In The Spotlight" page of the January issue of *International Projectionist* anent the Cocoanut Grove fire in my city in which 500 lives were lost.

On that evening, Saturday, November 28, 1942, I happened to be in the immediate vicinity of the night club when the fire broke out, and was an eyewitness to the removal of the many unfortunate victims of that catastrophe. It is useless to state now what should and what could have been done to avert this tragedy. The fact that high city officials including a Police Captain, Building, Fire and Wire Inspectors, and many others are under indictment speaks for itself.

You certainly hit the nail on the head when you said a lot of old laws would be dusted off and brought to light, for that is just what has happened in all our city departments. Many of these ancient laws are being put into effect, and absurd blanket orders are being issued by inefficient political appointees.

Our craft in this state is very fortunate in coming under the jurisdiction of the Department of Public Safety, which is comprised of a group of inspectors who have been in the service for many years, who know their business thoroughly and are neither dominated nor influenced by any of the so-called political "big-shots." Night clubs in the city of Boston are under the direct supervision of various city departments.

I would advise each local union to appear before its State Legislature and do its utmost to have enacted laws that would be enforced by honest officials. No time should be lost in bringing this matter to the attention of the proper authorities in each state, as many of the states are now fully aware of the urgent need to make certain changes in their safety laws. The Cocoanut Grove Club holocaust was a terrible price to pay for the awakening of the people to seek the safety measures to which they are entitled.

Progressive locals should start the ball rolling at once!

THAD C. BARROWS
President, Local 182
Boston, Mass.

Contest Question on Volume Control Offers Many Ingenious Solutions

THE ANSWERS to I.P.'s fourth contest question were many, indicating an increasing interest in emergency procedures to keep the show going. What to do when the main system volume control (or fader) fails, there being no other volume control in the system, has brought a large variety of answers. Several contestants proposed to control volume by the adjustment of a rheostat connected in the exciter lamp circuit. Others proposed to reduce the illumination on the sound track or the photoelectric cell by cutting down the light mechanically. The introduction of colored gelatine into the light beam from the exciter lamp was also proposed. The substitution of a voltage divider in conjunction with variation of the exciter lamp or PEC voltage, a homemade volume control or a radio volume or tone control were included.

The most ingenious proposal is based on the electrical conductivity of a common salt solution. The contestant proposes to place two fixed electrodes, representing the two outside terminals of a potentiometer, in a jar containing the salt solution and suspend a third electrode, the slider of the potentiometer, in the solution. Volume then is to be controlled by raising and lowering the third electrode. A pulley or other suitable means may be employed to permit the volume adjustment being made at a convenient location on the front wall. Since this control is in the voltage (or PEC amplifier) the signals are of comparatively low level and, as such, subject to noise pickup. This is particularly true of the connections to the grid (slider) and the coupling capacitor from the previous stage. Hence careful shielding is necessary. Also long grid leads are potential sources of serious trouble. So while this method might give sound, if the constants were correctly chosen and preliminary tests made to determine its characteristics, other methods having less probability of trouble are preferable.

The control of volume by adjustment of exciter lamp brilliancy gives good results within certain limits. As the brilliancy decreases the color spectrum of the light changes, which affects the frequency response. Toward the lower limit of sound audibility, the adjustment becomes quite critical. This method may be used, with a divider circuit, for relatively small volume changes. Operation above its rated current shortens the life of the lamp materially.

Varying the light falling on the optical system and hence on the sound track by an adjustable aperture or dissolver rapidly changes the volume. Here again frequency response is affected when any large volume changes are attempted. Such a procedure would be satisfactory in an emergency, but it would be an improvement to use the divider circuit also. Such a device positioned to reduce the light on the photocell is not nearly as sensitive, as the signal is generated by the change in light intensity but still offers a possibility.

Colored gelatines, either between the exciter lamp and the sound track or in front of the photoelectric cell, change the color of the light and, therefore, the quality of sound. Both the sound track and photoelectric cell have a very definite light color response. This may, however, be a rapid way of obtaining volume control when colored gelatines are readily available.

The voltage divider circuit may be applied whether the system has a main volume control (or fader) common to both machines or whether each machine has its own. In this case a constant impedance pad having a loss corresponding to the full house fader setting is desirable. This takes care of the average recording. An auxiliary volume control is necessary to give some adjustment for news reels or high level recordings, and possibly for low level prints if experience indicates this to be necessary. This may be a rheostat in the exciter lamp circuit, the photoelectric cell polarizing potential circuit, or a gain attenuator in the main amplifier. The PEC polarizing potential is not too critical below the flashover point so any ad-

Contest in Wartime Projection

A Test of Skill and Wits

KNOWLEDGE of projection, skill, and resourcefulness in meeting unusual conditions arising out of the war feature this novel contest, which is open to all practicing projectionists. Fancy writing, skill of presentation, win no prizes; prizes are awarded solely on the basis of how well the contestant has met the problem presented. The editorial staff of I.P. are the sole judges, and their decisions are final.

The following prizes are offered *each month*:

First Prize . . . . ***$10.00*** **in War Stamps**

Second and Third Prizes . . . . ***$5.00*** **in War Stamps**

Next Six Best Answers. . One Year's Paid-up Subscription to I.P.

Additionally, at the end of the contest, there will be awarded for the most consistent showing a

Grand Prize . . . . ***A $25.00*** **War Bond**

All answers much reach this office by the tenth day of the month following publication of the question: that is, all answers to February's question, published below, must reach I.P. by March 10.

Here is the question for February:

Your sound-head motor drives the sound head and projector by a device other than a belt. This device fails and is beyond repair. Because of war conditions, you can't get new parts for some weeks. What would you do?

Apply this question to your own equipment, your own projection room. It's your problem, you have to solve it; there'll be no show till it's solved.

For the most ingenious and *practical* solution you win $10.00 in war stamps and a running start toward the Grand Prize $25.00 war bond.

justment in this circuit will not be very sensitive. Auxiliary switches for changeover may be installed or exciter lamp changeover may be employed depending upon the type of system used.

When there is one main control per machine, it is usually in the grid circuit of one of the voltage amplifier tubes. Two resistors in series may be substituted for the full winding of the volume control, in other words an L-pad, the grid being connected to the junction of the two resistors. By proper selection of the value of the two resistors, full house volume may be arrived at. Additional adjustments by the methods just described may be employed.

For application in systems having a main volume control per machine some contestants have provided a length of shielded cable (microphone type) equipped with clips at each end. This is used to connect the output of the machine associated with the defective volume control to the other voltage amplifier with the operable volume control. Volume control of both machines may then be obtained and changeover is by exciter lamp. In some systems slight mechanical modifications may be necessary in the changeover switches.

The prize winners again have been selected on the basis of the comprehensive answers received. In some instances rather general descriptions of a proposed method were given, while on the other hand, several very complete papers covering various types of systems were received, together with sketches and in one instance, a model of a dissolver device.

The first prize winner, Fred Erhard, sent the model of a dissolver designed for use in front of the photoelectric cell. This is in reality a double shutter device which cuts both the top and bottom of the light beam entering the photoelectric cell. One lever operates both shutters, and it can be set in any position. He has assumed that all he has to work with is an old trailer can (*hope the WPB does not catch him at it*—ED.), solder, soldering iron, and some small nails for use as rivets.

Let us quote from his reply:

"This working model replaces the guard in front of the PEC in the WE D-206-A sound head and is used to vary the light beam reacting on the PEC from the exciter lamp. A dissolver of this nature can be used on any sound head, but I am using a WE D-206-A as an example. Place the fader on its highest point (no attenuation, no effect if fader is defective; he has also provided for an L-pad in place of the fader if necessary—ED.), leave the shutters on the dissolver closed until the projector is started, then open them slowly until you have correct volume. I tried it out on a Fox News and I found that by opening the shutters about 1/8 inch I had normal volume, and on Paramount's 'Palm Beach Story', which had a normal fader setting, I got the same volume by opening the shutters to about 5/16 inch."

George Wilde, the second prize winner, relies mainly on sketches covering several types of volume controls. One method of volume control proposed is the variation of the screen voltage of the first tube of his voltage amplifier. For this purpose, he has sketched an arrangement for using thirty flashlight batteries in series, with a tap switch to vary the voltage. This is ingenious but cannot be made up in advance, as the batteries deteriorate. His other methods, such as an L-pad in the grid circuit, a homemade tapped volume control, or a potentiometer in the screen circuit are more practical.

The third prize winner, M. J. Nederostek, suggests, among other proposals.

(*Continued on page* 22)

Cooperation Between Projectionist and Exhibitor Urged at S.M.P.E. Meeting

THE ALL-IMPORTANT topics of copper conservation in motion picture theatres and the cooperation between projectionists and exhibitors were the features of the meeting held last month by the Atlantic Coast Section of the S. M. P. E. The meeting was opened by Dr. Alfred N. Goldsmith, Chairman of the Atlantic Coast Section, who introduced the speaker of the evening, Mr. Jay Emanuel, publisher and motion picture theatre exhibitor.

Mr. Emanuel read a paper on "War Conservation from the Theatre Owners Viewpoint," in which he emphasized the importance of the conservation and proper maintenance of projection room equipment. He bore out our contention that a theatre owner seldom, if ever, knows anything about the maintenance of his projection room equipment. "As a theatre owner," he read from his paper, "it would be foolhardy for me to attempt to analyze sprocket by sprocket, grease cup by grease cup, cleaning method by cleaning method, and the many ways to 'baby' and maintain our theatre equipment. This is a specialized knowledge that has been correlated in numerous and very adequate forms by manufacturers, dealers, and service companies who are much better qualified to author such surveys that I am . . . I also recognized from actual experience in my 30 years of theatre operating background, that developments and improvements in projection and sound equipment and methods were actually progressing faster than the obvious changes in physical theatre fronts, seating plans, interior decorations, and patron comforts. Therefore, in each remodeling program, I managed to work out a deal whereby my probably adequate projection room and back stage equipment was traded for the latest and most modern equipment. In this connection I was favored in having Harry Blumberg, manager of the Philadelphia branch of the National Theatre Supply Company, as both my friend and confidante, as well as my vendor. I merely told him that I wanted the best and accepted his advice without question . . . Equipment records which have been kept by each manager in his theatre files and duplicated in my general office files, have been brought up-to-date with added notations on the current condition of each item. With such a record at hand, I have gone over each theatre with my supply dealer and with the engineers of my local sound and equipment service in order to estimate the potential life and possibilities of breakdown which each item had."

He also paid tribute to the projectionists employed in his theatres, stressing the close cooperation existing between his projection room personnel and his organization, by reading further:

"The projectionists in our theatres are a pretty well trained group of old-timers, who are thoroughly skilled in their tasks. I have always insisted on having good men assigned to my theatres, and have been willing to pay top scale for them; some of my projection room employees have been in their present jobs for upwards of fifteen years. My relations with my projection room personnel have been cooperative and friendly, and I know that the operation in my theatres has been troublefree and of the highest order. At my request, my projectionists report all of their difficulties and make helpful suggestions, for which I try to compensate them."

Mr. Emanuel's paper also calls for a local equipment conservation committee in each territory, consisting of one representative from each recognized supply store, an equal number of representatives each of the major circuits, independent theatres, and I. A. T. S. E. local unions. The number of equipment dealers operating within a given territory would govern the number of representatives comprising each committee. It would be the objective of each local committee to create pools for all equipment in a given territory, and to inaugurate a series of exhibitor meetings in the key cities of each district for the purpose of educating theatre owners to the benefits derived from such a plan.

Review Of Projection Fundamentals

VI.—Vibrations

New technical problems will unavoidably be imposed on the projectionist by war conditions. At the same time, he will want to prepare himself for the technical surprises sure to appear when the war ends. In the conviction that our readers will consider the present an ideal time to review their knowledge of fundamentals, IP here presents the sixth of a series of articles dealing with the bases of electricity, optics, sound and other foundations of projection room technique.

VIBRATIONS OF many kinds, including sound, electrical and light vibrations, are among the most important business of the projectionist. A vibration is a periodic or oscillatory motion. It is a motion that repeats itself over and over through the same path. Thus, if a projector head vibrates because it is worn or out of adjustment, each single particle of material in that mechanism may move upward, for example, 1/100th inch, then downward 1/100th inch, then upward 1/100th inch, etc.

But the vibration in the projector head may not be only up and down—the head and each separate particle of matter in it may simultaneously be vibrating forward and back also, and from side to side also. In that case the head, and each particle of its matter, would follow a vibratory path constituting a complex closed curve, not simply an up-and-down straight line—none the less, if the path were followed regularly so many times per second the motion would be a steady vibration.

It is convenient and helpful, and simplifies matters to think of and treat vibrations in terms of waves. A wave in water is simply a vibration; it consists (as a cork floating on the water will show) of a regular, periodic up-and-down motion of the water molecules. Although the water may appear to move laterally also, this is an optical illusion; the cork shows that while the *wave* or vibration moves latterly, the water does not but simply heaves up and down; in fact, if there is a current opposed to the waves the cork—and therefore the surface of the water—may be moving in one direction while the waves—the vibration, not the water—are moving in a different direction.

Similarly with sound waves, which are vibrations in air—the *air* does not move throughout the theatre from the sound source at the loudspeaker. If it did, operation of the loudspeakers at high volume would create a considerable draft. It is the vibration that moves through the air, spreading from the speakers to every part of the auditorium. This particular vibration needs a little further attention, for it is different in kind from the vibration represented by a common wave in water, or by a projector head out of adjustment.

There are two different kinds of waves—transverse and compressional. An ordinary wave in water is of the transverse type. Consider the bobbing cork, or a single molecule of water, in relation to the wave as a whole. The cork, the water molecule, move up and down—the wave moves or spreads laterally. That is, the direction in which the vibration moves is at right angles to the direction of motion of the individual particles of the matter undergoing vibration.

The transverse wave can be represented quite neatly by tying one end of a rope to a wall; and, holding the other end in one hand without stretching the rope too tight, by moving the wrist up and down. A wave will move along the rope from hand to wall. The particles of the rope are moving up and down. The *wave* or vibration is progressing at right angles to that direction, along the rope to the wall.

To represent a compressional wave, substitute a long spiral spring for the rope, and move the hand forward and back. A wave or region of compression, followed by a region of expansion, can be made to travel along the spring from hand to wall. In this case, however, the individual particles of the spring are moving in the same path as the wave. They are not moving at right angles to it.

Polarized Waves

Many of the vibrations the projectionist encounters in his work are in a sense combinations of compressional and transverse waves. Return again to consideration of the loudspeaker. The diaphragm drives forward, compressing or pushing together the molecules of air immediately in front of it. These, in turn, compress or push against the molecules in front of them. These molecules repeat the process and thus a series is set up which eventually pushes against the eardrum of the listener. But meanwhile, each molecule, having collided with the molecule just ahead of it, rebounds; thus each individual molecule moves through the same path as the wave as a whole, and to that extent the vibration is compressional.

But that is not all there is to it. You don't have to stand in front of the loudspeaker to hear its sound. You can stand alongside of it and hear it. Obviously all the molecules don't push straight ahead and rebound straight back. Some strike or are struck glancing blows, and are driven, or rebound, sideways.

A compressional wave, in a fluid such as air or water, spreads more or less in all directions (less, if it is of high frequency). Since the vibration spreads in all directions, all the molecules of the air are not moving solely in the same path as the vibration. Some are moving at right angles to it, or at various angles to it. In fact, many of the molecules are somewhat like the individual particles in the badly vibrating projector head — simultaneously moving up-and-down, forward-and-back, and from left-to-right: following a small but complex curved path.

Light, Heat, Electricity

Light, although some of its details are still a mystery, presents many evidences of being vibratory in nature, with the vibration normally proceeding in all directions at once. Of course this does not mean that a beam of light cannot be concentrated or focussed. Sound, which is a similar kind of vibration, can be concentrated into beams by suitable trumpets. One of the faults of older-type loudspeakers was that they concentrated too much sound into too narrow beams. But in light, as in sound, individual particles of the "ether" or whatever it is that vibrates, vibrate in all directions, with the direction of the wave and at all angles to it.

Polaroid filters illustrate this fact beautifully, for they hold back and refuse to pass all vibratory motion except that proceeding in certain directions. This can be understood by further reference to the sound wave. The sound molecules vibrate in three general directions—up and down, right and left, back and forth.

Suppose the mean free path of a molecule—the distance it can move in any direction before it collides with the next molecule and rebounds—to be 1/1,000th of an inch—to take an arbitrary figure. Then if you were to place in the path of the sound a large baffle board containing a slit 1/2,000th inch high, the left-to-right and forward-and-back vibrations could still proceed. but up-and-down vibration, or any molecular motion that included a large component of up-and-down vibration, would be stopped. A

good part of the sound would be lost.

If in front of this board you placed a second baffle board, with a similar slit arranged vertically, then left-to-right and up-and-down vibrations would be intercepted, only back-and-forward vibration could get through. If there were no other path for the sound around the edges of the boards none would get through.

Polaroid consists of crystals (embedded in a transparent plastic material) which act like these slits in the baffle boards just imagined, in that they pass light vibrations when the vibratory motion is in certain directions only. Hence if light is passed through polaroid, vibratory motion up-and-down (let us say) is blocked. If then another layer of polaroid is placed in the path of the light in such a way that left-to-right vibratory motion also cannot get through, practically all the light is stopped.

This phenomenon is one of many that are taken to prove that light consists of, or is accompanied by, vibratory motion, though what particles undergo that motion is not known.

Whatever they are, they are apparently the same as the undiscovered particles that comprise electro-magnetic fields, for light obeys the same mathematical laws as high frequency electro-magnetic phenomena.

There appears to be a vast spectrum of vibrations, the lowest in frequency being the electro-magnetic field that surrounds a conductor carrying low-frequency a.c. As the frequency is increased the field takes on the properties of a radio field—beginning as low as 30,000 cycles or thereabout it can be detected over vast distances with suitable "receiving" apparatus. Beginning just beyond the highest radio frequencies vibrations of apparently identical kind manifest themselves as heat. The highest frequencies of heat, in turn, merge imperceptibly into the lowest frequencies of light—the infra red.

Light, again, is said to have many wave-lengths (to most of which the eye does not respond). There is a whole band of (invisible) infra-red frequencies. The lowest frequency of light that can be seen is red; successively higher frequencies range through yellow and blue to violet—where the eye again gives up. Beyond the visible violet, still higher in frequency, there is the family of ultra-violet frequencies. Beyond these again, X-rays and cosmic rays.

Sound waves do not belong to this group of vibrations. These electro-magnetic waves vibrate in an unknown medium. The medium of ordinary sound vibrations is familiar air; the particles that vibrate are the molecules of which air is composed. Sound will also travel through water, a metal rod, etc., in which case the molecules of water or of the metal undergo vibration at sound frequencies. When a loudspeaker operates vibrations of identical frequency and amplitude occur in at least two different mediums simultaneously; in the electromagnetic field surrounding the speaker coil and in the air surrounding the speaker diaphragm.

(*To be continued*)

MOTIOGRAPH EXPANDS

To better facilitate the handling of extensive war orders Motiograph, Inc., manufacturers of projectors and sound systems, has not only gone on a 24-hour work basis but has also acquired an additional plant.

Completion of a navy contract for sound and projection equipment will be followed by the production of aircraft and ordnance components, to which the company will devote 100% of its facilities.

PROJECTOR MAKERS HELP SLASH TRAINING TIME

High praise for the war contributions of Chicago camera and projector manufacturers is contained in the recent issue of Domestic Commerce Weekly, publication of the U. S. Department of Commerce.

"Certain activities of the Army and Navy, as well as civilian defense, health and nutrition programs, agricultural production and other essentials, not excluding morale," writes Walter A. Foy, consultant of the Department's Chicago area, "depend upon the film as the primary educational medium."

LETTERS TO THE EDITOR

To the Editor of I. P.

I have been reading INTERNATIONAL PROJECTIONIST for a good many years and in that time I have come across many enlightening and interesting articles written by projectionists who have discovered some novel and useful idea on how to improve the quality of their work, and who were willing to pass the information on to others. I feel that some other fellow might be glad to learn about a couple of "kinks" that my partner and I use in our projection room, and I am submitting the following ideas relative to the quality of the light on the screen, and the conservation of film. These ideas may have been put into practice before, but I have never seen them published.

1. I believe that the thinner coating of copper on the new Victory Suprex carbon has increased the electrical resistance of this carbon, thereby causing the carbon to burn at a rate relative to its length, which then results in uneven feeding and a poor light on the screen. We have found that by connecting a jumper of flexible lamp house lead-in wire (be sure that the wire is of adequate size for the current consumed by the arc) about a foot in length from the carbon jaw to the carbon guide, it results in a smoother arc-feed operation and a steadier light. The jumper practically makes up for the lack of copper on the carbon since it brings the current to within 1″ of the end of the carbon, and thus a steady feed is maintained regardless of the length of the carbon.

2. We hear a great deal these days about the conservation of film. We can begin to conserve in the projection room by overcoming the problem of the "Date Strip," which always gets it in the end—yes, both ends. For a number of years it has been our practice to attach about six or seven frames of black leader to both ends of each date strip; then whenever the date strip has to be detached from the current trailer only the black leader is wasted. Thus, at a time when date strips are hard to get we are increasing the life of these bits of important film many times.

CLINT PHARE.
Cedar-Lee Theatre,
Cleveland, Ohio.

To the Editor of I. P.

On December 6, 1942, the Third District Convention of the New England Locals of the I.A.T.S.E. was held at the Hotel Bancroft, Worcester, Mass., and the delegates assembled unanimously went on record as endorsing INTERNATIONAL PROJECTIONIST, and recommending that all local unions subscribe to it for their memberships.

In the discussions at the Convention it was brought out that all of your technical articles are necessary information for our members and for each local union's educational policy. We believe that every member of the I.A.T.S.E. should subscribe to I.P. as it is the only magazine published that is devoted exclusively to the best interests of the motion picture projectionist.

FRED W. NEWCOMB.
Secretary, New England
District Number 3.

TELEVISION'S FUTURE BRIGHT

Television has again been forecast as "a great post-war industry"—this time by Col. David Sarnoff, RCA president, in his annual year-end review of radio and television.

"Television," Sarnoff says, "operated by NBC in New York, has played an important role in air raid instructions and civilian defense. Its laboratory status is a war secret, but those confident of the success that marks wartime developments, expect television to emerge from this war in such form as to make possible a great post-war industry."

● BUY WAR BONDS ●

IN THE SPOTLIGHT

(*Continued from page* 13)

the fallacy of trying to give his theatre patrons a first-class show with worn or damaged projection equipment. It just can't be done. Film damaged by defective parts in the projection machine should be returned to the exchanges with a notation to that effect, and it will then be up to the exchanges themselves to see that such conditions are not permitted to continue. The conservation of film is an important war measure and we must avoid those practices that cause unnecessary damage.

● Frank X. Smith, member of Local No. 458, has been elected trustee for three years by the Portland, Maine Central Labor Union.

● The Governor's Councillor, Clarence Barnes, Mansfield, Mass., has filed three bills in opposition to labor, which will be opposed by the Massachusetts State Federation of Labor. One bill would seek to license all labor unions and have them file returns of their financial standing; another would prohibit unions from permitting persons acting in their behalf to contribute funds for political purposes, and the third bill would prevent unions from assessing or collecting fees or dues except from bona fide members or application men. We shall be very much interested in the outcome of these proposed bills, and will report on them in this department as soon as we hear anything further on the matter.

● Local 182, Boston, Mass., held its annual election recently and Thad Barrows was re-elected president for the 26th consecutive year. James F. Burke, business agent, continues in office for another year. Other officers elected were B. McGaffigan, vice-president; A. R. Moulton, financial secretary; J. Rosen, treasurer; J. Nuzzolo, L. Pirovano, and J. Gibbons, executive board members, and J. Richie, sergeant-at-arms.

● The success of a union depends upon well-trained and well-informed leadership. It is impossible to effect a satisfactory working agreement through collective bargaining when unfriendly officeholders are in charge of negotiations. The stability of a labor union and the welfare of its members rests wholly upon the shoulders of its leaders, who should be chosen for their ability to enforce agreements as well as to negotiate them.

● At the recent annual election of officers for Local 444, New Kensington and Tarentum, Penna., Bill Bordonaro was re-elected president sans opposition. The other officers elected are Bernie Zamparini, vice-president; I. E. Fike, business agent, and Clyde Johnson, as recording secretary. J. J. McCluskey and Joe Kadluk were re-elected executive board members. Local 444 was our first assignment as International Representative—that is going back some years.

● Last month we made mention of the fact that Jerry Littenberg (Altec) had enlisted in the navy, but it seems we were a bit premature. Although Jerry filed his application for enlistment in the navy some time ago, he has not yet been called. Let us know when you get that famous "Greetings" letter, Jerry, and we will wish you good luck all over again.

● We don't think the I. A. business agents in Canada would have any difficulty in getting the Canadian government to exercise the ruling in "'Kings Rules and Admiralty Regulations" whereby any licensed projectionist in the British Empire taking precedence over a non-licensed projectionist. We understand that the Canadian National Film Board has under its jurisdiction (Vancouver to Nova Scotia) about 50 traveling theatres. These mobile units are equipped with 16 mm. projectors, and

the films are shown in remote districts. Why can't these units be manned by I. A. men?

● The I. A. can boast of at least one woman member in the WAACS. Pearl Walker, member of Dallas, Texas Local B-53 signed up with the WAACS and is now stationed at Daytona Beach, Fla. We understand she is working hard for a commission—here's hoping you make the grade, Pearl.

● At a special meeting of Local 306, New York City, a resolution was introduced and passed providing for a pension fund for old-timers. The adoption of this resolution now assures those members who have reached the age of 60 and wish to retire, and who have retained membership in the local for 20 consecutive years, a pension of $21 a week for the rest of their lives. In addition to their retirement pension, these members also participate in the $4,000 death benefit. Special credit should be accorded to Ben Stern, Eddie Stewart, Sam Salvino, Jimmy Ambrosio, and Abe Horowitz for the introduction of this worthy resolution. A swell job well done —and one that deserves recognition from the entire labor movement!

● Fred Boekhout, business agent for Local 253, Rochester, N. Y., has started wage negotiations for his local. We place our money on Fred.

● Abe Lang and Sam Price, both former ERPI men and members of Local 306, now employed by Paramount as projectionists, have been friends and neighbors for a number of years. The friendship of these men has been further cemented by their one common bond of sympathy—the paternal instinct in each is extremely strong. Lang, the senior member of this combine, is godfather to every stray cat in Long Island, while Price just became the father to his fourth child—a daughter, Karen Elizabeth.

● Many years ago a former member of Chicago Local No. 110, John Pane-Gasser, joined the Metropolitan Opera Company, and his voice reecived the plaudits of Arthur Toscanini and the late Georgio Polacco, who at that time were also members of the opera company. Does anybody know of the present whereabouts of Pane-Gasser?

NEW EDITION "BLUE BOOK OF PROJECTION" OFF THE PRESS

The latest (seventh) edition of F. H. Richardson's "Bluebook of Projection" has been published by the Quigley Publishing Company. This new edition, which was edited by Aaron Nadell (Editor of I. P. before his induction in the Army), brings the contents up-to-date with respect to both operating practices and equipment design. Among the special features of this edition are a new arrangement of material to facilitate reference, five chapters on general electricity, and four chapters on television.

Richardson's initial textbook on projection was published in 1910, a few years after he had written a small manual of general instruction on projection.

REPAIR PARTS STILL AVAILABLE

Supply dealers still can obtain necessary repair parts for theatres, Ray Colvin, executive secretary of the Independent Equipment Dealers Protective Association has advised the association's members.

Supply dealers who stocked up on any items before the emergency became acute will not be penalized, Colvin also reported.

American Red Cross Contributions

FOR MORE than a score of years, people in all walks of life have been making annual contributions to support the far-flung work of the American Red Cross. The little Red Cross stickers in countless windows which generally made their appearance during November were visual evidence of the nationwide support of, and confidence in, the Red Cross.

During 1942, however, more than 1,000,000 men and women made a new contact with the Red Cross. They were those who each contributed a pint of their blood to the Red Cross Blood Donor Service. Collected at the request of the Army and Navy, this blood is processed into plasma and serum albumin, and today it is being used on the world's battlefields, helping to give our wounded a much better chance at life. In 1943, 4,000,000 donors are needed.

It may safely be said that the Red Cross Blood Donor Service has opened the eyes of many to the real significance of the Red Cross. Another eye-opener, though not so well known, is the fact that in North Africa, New Guinea, and the Solomons, and wherever else the need arises, surgical dressings made by the Red Cross volunteer workers are being used to bind the wounds of those who are out there prepared to give their last full measure of devotion.

On the lighter side of the picture, the Red Cross has established some 75 servicemen's clubs and recreation centers in leave areas abroad where our soldiers, taking a respite from their duties, find everything they could desire for a good time: comfortable beds, showers, home cooked food, games and entertainment.

Despite all the work of the Red Cross on behalf of the serviceman, it continues its activities at home. Instruction in first aid, home nursing, work in hospitals and other fields of public welfare, keep the organization busier than ever before.

LOEW'S EARNINGS RISE

An increase of nearly one million dollars is reported by Loew's, Inc. The net for the year ending August 21, 1942, was $12,133,294 after provision for depreciation and taxes. The figure for the previous twelve-month period was $11,134,593.

RCA FORMS NEW SERVICE COMPANY

Edward C. Cahill, manager of RCA Victor's sound equipment activities, has been made president of the RCA Service Company, Inc., a newly formed subsidiary of the parent organization. Cahill's new appointment will not conflict with his responsibilities with the RCA Victor Division. W. L. Jones, former manager of RCA Victor's Service and Installation Division, has been appointed vice-president and general manager of the new company. There are no changes in either the managerial or the technical staff of the RCA Victor service organization, which is now incorporated in its entirety within the new company.

RCA Service Company, Inc., will continue to devote a major part of its activities to the installation and servicing of vital radio and sound equipment for our armed forces in all parts of the world. The new company will also continue to conduct its training school for technicians for the U. S. Signal Corps.

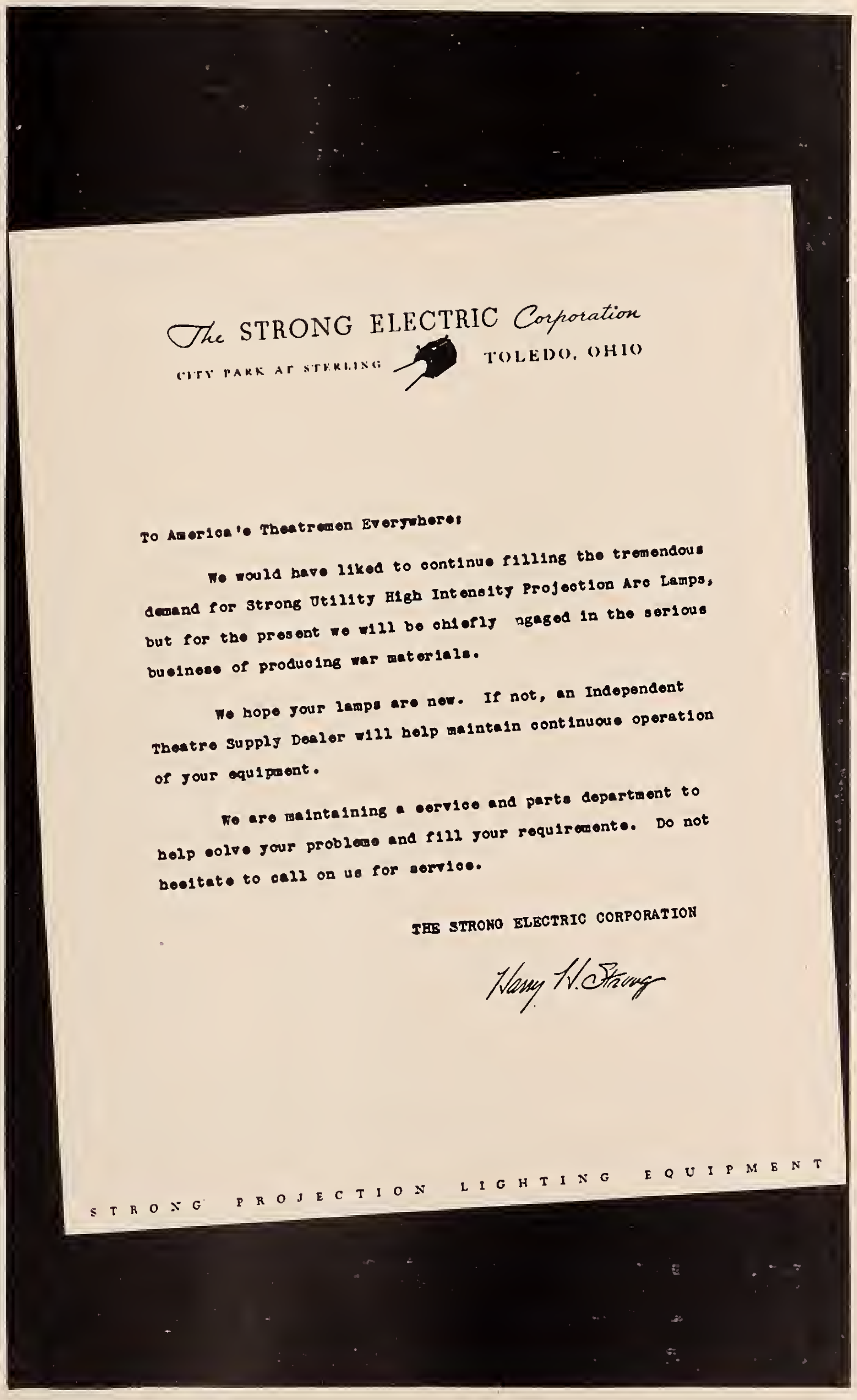
District service offices are maintained in Hollywood, San Francisco, Dallas, Kansas City, Atlanta, Pittsburgh, Cleveland, Chicago, New York City, Boston, Philadelphia, and Scranton. A highly trained technical staff is maintained at each one of the aforementioned district offices for the installation and servicing of theatre sound reproducing and broadcast station equipment, in addition to other RCA radio and sound equipment used in industrial plants, schools, churches, hospitals and the home.

WPB ISSUES NEW LIST OF CRITICAL MATERIALS

The WPB has issued a new list of critical materials, use of which is denied entirely to civilian industry, no matter how necessary they may be to civilian industry.

Materials on that list that are used in the projection room, either directly or as components of tubes or other vital equipment, include:

Aluminum, brass, bronze, cadmium, copper, molybdenum, nickel and nickel alloys, tantalum, tungsten, zinc and every form of steel.



I. P. CONTEST

(*Continued from page* 15)

connecting a resistor of twice the value of the volume control between the two outside terminals of a wire wound control. This applies when there is an open in the winding. Now the volume control normally functions as a voltage divider. The signal voltage from the ground side of the control to the slider, which is connected to the grid, is then the voltage applied to the grid. If the open is below the normal setting of the control, the addition of the shunt resistor forms an L-pad in which the series arm is the volume control above the open in the winding. The shunt arm loads the input to the tube and its value determines the signal voltage available at the upper end of the series arm. Movement of the slider will vary the volume, but will not give the attenuation possible in the standard circuit; it can never reach the "O" voltage point. If the break is above the normal setting, the outside connections to the volume control should be reversed, that is, the ground side should be connected to the grid side of the coupling capacitor. Otherwise, there is no signal voltage on the grid and hence no sound. We are including this proposal as worthy in principle as, with proper selection of the value of the shunt arm, it is simple and sound can be restored quickly.

George Beltz refers to the W. E. fader with "red" and "white" sides and proposes to substitute a radio volume control of proper resistance for each side with a single pole, double throw switch for changeover. Even though the W. E. fader is of the constant impedance type this arrangement should give intelligible sound.

Maurice Rushworth has experimented with gelatines in front of his 3A photoelectric cell in a WE-86 type system and has found that three thicknesses of amber gelatine cut the volume in half, two thicknesses about 25% with no reduction of high frequency response, as the gelatine follows the slit. Due to the characteristics of the cell, however, it is quite possible that other colors of gelatine may seriously affect the response.

Martin Teker would substitute two 500,000 ohm resistors in series for a volume control in the grid circuit, connecting the grid to the junction of two resistors. This would give a volume equivalent to normal setting. He would then remove a 60 ohm monitor volume control (which is always at full volume setting anyway) and connect it in series with the stage speaker line. In a low impedance stage line, this arrangement will probably give adequate volume adjustment. We hope it will have adequate current carrying capacity as the current in the stage circuit in the larger systems runs into amperes.

Leo Vigil has used different colored gelatines in a similar emergency, light colors for increased volume, and darker colors for decreased volume, and kept the show going.

William Dugard has a very ingenious proposal in the form of a homemade carbon potentiometer made from an ordinary business card. With a soft pencil he makes a tapered dense black area along one long dimension of the card. At each end are sizable black areas for the connections. The slider consists of two alligator clips, one being moved at a time along the edge of the card to regulate volume, and then the other is removed. Thus the circuit is not broken, and by the use of clips insulated with fingers from rubber gloves, capacity effect and noise are minimized. He has actually tried this out in his system with satisfactory results.

S.M.P.E. ATLANTIC COAST SEC. MEETS FEBRUARY 25

The next meeting of the S.M.P.E. Atlantic Coast Section is scheduled to be held February 25 at the Hotel Pennsylvania, New York City. Henry Anderson, chairman of the Society's Sub-Committee of the Theatre Engineering Committee, will be the principal speaker. Mr. Anderson, who is manager of the insurance department for Paramount Pictures, Inc., will give a talk on "Flameproofing of Curtains, Draperies and Other Textiles."

Among the topics to be discussed by other members of the Sub-Committee are "Fire Extinguishing Devices for Motion Picture Theatres," by E. W. Fowler, National Board of Fire Underwriters, and "Use of Luminous Materials in Blackouts," by James Frank, National Theatre Supply Company.

December Contest Winners

First Prize

FRED ERHARD
P.O. Box 1130
El Paso, Tex.

Second Prize

GEORGE WILDE
State Theatre
Columbia, Ill.

Third Prize

M. J. NEDEROSTEK
2001 Green St.
Allentown, Penna.

Winners of One-Year Subscriptions to I. P.

GEORGE J. BELTZ
33 Ninth St.
McMechen, W. Va.

H. J. PLEXMAN
404 Murray St.
Sudbury, Ont., Canada.

MAURICE RUSHWORTH
531 S. Longwood St.
Baltimore, Md.

WILLIAM J. SCHMITZ
61 Oakdale Blvd.
Pleasant Ridge, Mich.

MARTIN TEKER
Sheridan, Mont.

LEO VIGIL
East 212 Walton
Spokane, Wash.

Honorable Mention

CHAS. W. COOK
119 Brown St.
Santa Rosa, Calif.

JESSE P. DELMORE
50 Cross St.
Southbridge, Mass.

WM. R. DUGARD
4670 Josephine St.
Denver, Colo.

CHAS. R. GLASER
4600 Smithfield St.
Shadyside, Ohio

EARL H. GRIFFEN
390 Varney St.
Manchester, N. H.

CHAS. HARTUNG
237 N. Park Ave.
Cape Girardeau, Mo.

RUDOLPH KOLLER
219 Drake St.
San Francisco, Calif.

KEN PASCOE
Nordic Theatre
Marquette, Mich.

FRED PEARSON
293 Hardin Ave.
Toronto, Ont., Canada

RAY RIDGEWELL
79 Cumberland Ave.
Portland, Maine

INTERNATIONAL

PROJECTIONIST

MARCH 1943

VOLUME 18 • NUMBER 3

25c A COPY • $2 A YEAR

America's Secret Weapon

You won't find it on the production lines at Rock Island or Willow Run.

It isn't guarded at the Brooklyn Navy Yard, or tested at Aberdeen.

But it's the toughest weapon these men you are looking at will ever take into battle. It's the stuff with which all our wars are won.

The boy in the uniform doesn't call it *morale*. That's a cold potatoes word for something John American feels deep and warm inside.

Perhaps he can't give it a name. But he can tell you what it's made of.

It's made of the thrill he gets when his troop train stops at a junction point and fifty good-looking girls are at the station with cigarettes.

It's made of the appreciation he feels for a bright new USO clubhouse where he and his friends can go for a few hours' rest and relaxation.

It's made of laughter and music—when Bob Hope or Lana Turner visits his camp with a USO show.

It's even made of a cup of coffee and a Yankee smile—at some lone outpost in Alaska or the Caribbean

Maybe it's just a feeling of kinship with this land of a hundred million generous people. Maybe it's just the understanding that this whole country cares; that the soldier is bone of our bone; that he and we are one.

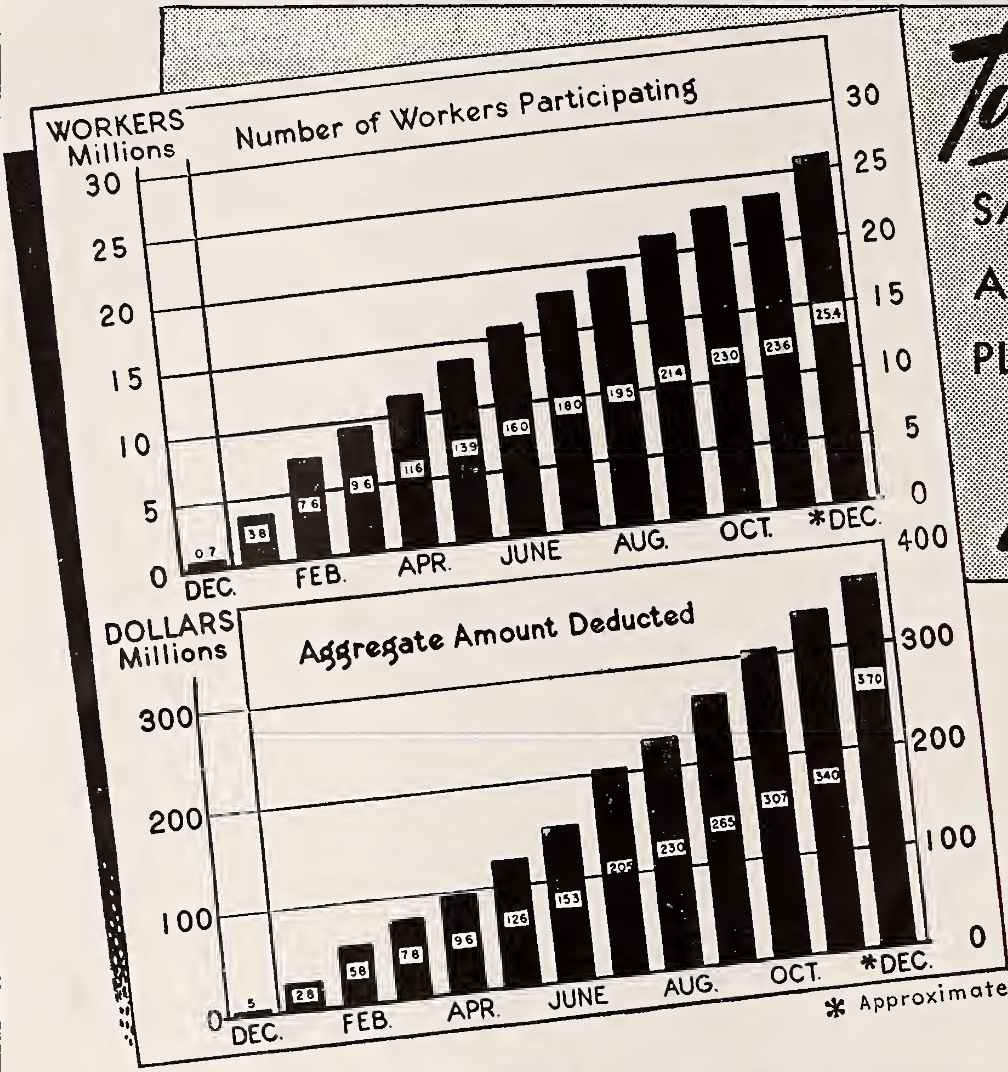
Name it if you can. But it's the secret weapon of a democratic army.

What can you do to sharpen this weapon? Give to the USO. This great national service organization has been entrusted by your government with responsibility for the service man's leisure needs.

The requirements of the USO have grown as enormously as our armed forces themselves. This Spring we must have $32,000,000.

Give all you can—whether it's a lot or a little. Send your contribution to your local chairman or to USO, Empire State Building, New York City.

★ **USO** ★



Tomorrow's

SALES CURVES ARE BEING PLOTTED . . .

Today

THESE CHARTS SHOW ESTIMATED PARTICIPATION IN PAYROLL SAVINGS PLANS FOR WAR SAVINGS BONDS *(Members of Armed Forces Included Starting August 1942)*

STUDY THEM WITH AN EYE TO THE FUTURE!

There is more to these charts than meets the eye. Not seen, but clearly projected into the future, is the sales curve of tomorrow. Here is the thrilling story of over 25,000,000 American workers who are today voluntarily saving close to FOUR AND A HALF BILLION DOLLARS per year in War Bonds through the Payroll Savings Plan.

Think what this money will buy in the way of guns and tanks and planes for Victory today—*and mountains of brand new consumer goods tomorrow.* Remember, too, that War Bond money grows in value every year it is saved, until at maturity it returns $4 for every $3 invested!

Here indeed is a solid foundation for the peace-time business that will follow victory. At the same time, it is a real tribute to the voluntary American way of meeting emergencies that has seen us through every crisis in our history.

But there is still more to be done. As our armed forces continue to press the attack in all quarters of the globe, as war costs mount, so must the record of our savings keep pace.

Clearly, on charts like these, tomorrow's Victory —*and tomorrow's sales curves*—are being plotted today by 50,000,000 Americans who now hold WAR BONDS.

EVERYBODY EVERY PAYDAY AT LEAST 10%

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INTERNATIONAL PROJECTIONIST

International PROJECTIONIST

With Which is Combined Projection Engineering

Technical Editor, C. F. Alexander

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Monthly Chat

HAS everyone read the paragraph in February's "In the Spotlight" pertaining to film damage? We believe it is so important that we want to refer to it again. Film must be conserved if theatres are to continue in operation, and constant examination of film is a "must" factor today. The film path in a projector is a long one and there are many spots where films may be damaged if the parts are not well maintained.

Projectionists must examine all sprockets, rollers, gates and other parts in contact with films at stated and frequent intervals. Make sure that all parts are adjusted properly and that rotating devices are lubricated as specified in manufacturers' instructions. There are many ways in which equipment may be kept in perfect condition during the emergency and it seems to us that it is up to projectionists to study their equipment and utilize every measure that will lengthen its life.

• • •

We are nearing the end for the time being, for this month's question in the "Contest in War-Time Projection" will be the final one in this particular series, so if you want to show your skill and win war stamps and other prizes you'll have to get on the job right away. Well, within a few days at least.

The answers present an interesting and comprehensive coverage of various types of difficulties that may be encountered in the projection room, and furnish practical hints to all in the industry. So many of the contestants have consistently given such detailed and accurate answers that the award of the Grand Prize will require an extremely careful analysis of the many letters that have been received.

And now for some news: Another contest, new and interesting, will be announced within a short time. It will call for a test of skill and wits, just as does the expiring contest, but will be different, with a big, big "D," as Gilbert & Sullivan told us.

• • •

There is a very much broader field of activity for the projectionist just over the horizon. His services will be in much greater demand not only for entertainment of the general public, but in other unrelated fields. His responsibilities may be expected to increase. The equipment may be of a more precise nature requiring more exact adjustment and operation. There may be more "gadgets" associated with the equipment, each one playing an important part in the overall performance of the system.

There have been great strides in the electronic field. New vacuum tubes with entirely new applications are constantly being introduced. At present their application is confined strictly to the War effort, but when it is over they will find their place in the commercial field.

INTERNATIONAL PROJECTIONIST

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A Power Unit With Automatic Current Control

By *LEROY CHADBOURNE*

THE schematic of an exciter lamp supply unit with automatic control of the output is shown in Figure 1. This unit has several interesting features; namely, the provision for emergency AC supply, AC pre-heat, a tapped secondary on the rectifier transformer for voltage adjustment, and the method of adjustment for constant output voltage and current.

This device actually consists of two separate current supply units; one for AC and the other for DC. The AC circuit is shown at the top of the figure. Note that the power to the transformer T_1 is controlled by the switch S_1 and that T_1 has primary taps designated as "105", "115" and "125."

Therefore this transformer can be used on power lines having voltages between 105 and 125 AC, 60 cycles, without overheating or too wide variations in the output voltage. The secondary has a 9.5 volt and a 2.0 volt section. The former is the emergency AC exciter lamp supply for use in case the rectifier section shown in the lower part of Figure 1 fails. When switch S_2 is in "AC" position this emergency circuit is in use. The rheostat R_1 is used to adjust the power flowing in the circuit to 9 volts, 4 amperes; measured between terminals "Com" and "DC".

Since the system in which this power unit is used was designed for a DC operated 9 volt, 4 ampere exciter lamp a slight increase in hum level will be evident when this lamp is operated on AC. Nevertheless, it is not objectionable and as an emergency measure to keep the show going is a desirable feature.

The Pre-Heat Circuit

The two volt AC pre-heat circuit always is connected, by suitable switches associated with changeover, to the "Off" exciter lamp. The filament of this lamp then is said to be pre-heated, and will show a dull red glow. This feature is provided to overcome the inherent thermal lag in the cold filament of an exciter lamp. That is, from the instant the current is applied to the cold filament of the lamp approximately three seconds will elapse before sound will come in, and possibly longer, depending upon the size of the filament.

If, however, the filament is pre-heated, or kept warm, by a small current, the time required for the normal current to heat it to normal operating brilliancy will be decreased, and by properly selecting the pre-heat current with relation to the normal operating current the time delay can be reduced to a point where it is not audible. Pre-heat also tends to lengthen the life of the exciter lamp.

Tests have been made which indicate that the initial rush of current through the cold filament, or thermal shock, is more harmful to its life than is continuous burning. Pre-heat is used in conjunction with sound and exciter lamp changeover and a rapid noiseless changeover may be obtained.

Returning to the rectifier circuit shown in the lower part of Figure 1 note that switch S_1 and switch S_2 control the power supply to the primary of transformer T_2. When switch S_2 is in position "AC," the primary of this transformer is open, thus permitting servicing of the unit without interrupting the show. When switch S_2 is in "REC" position, the circuit to the transformer is closed and likewise the DC output circuit to the "DC" terminal.

The rectifier circuit is of the conventional full wave type, using two half-wave tungar bulbs, excepting that there are four taps on each half of the transformer secondary. These taps serve to adjust the rectified AC voltage delivered to the input to the two-stage filter incorporated in the unit. They may be used to compensate for changes in line voltage, not taken care of by the primary taps on T_2; ageing of the tungar bulbs and to

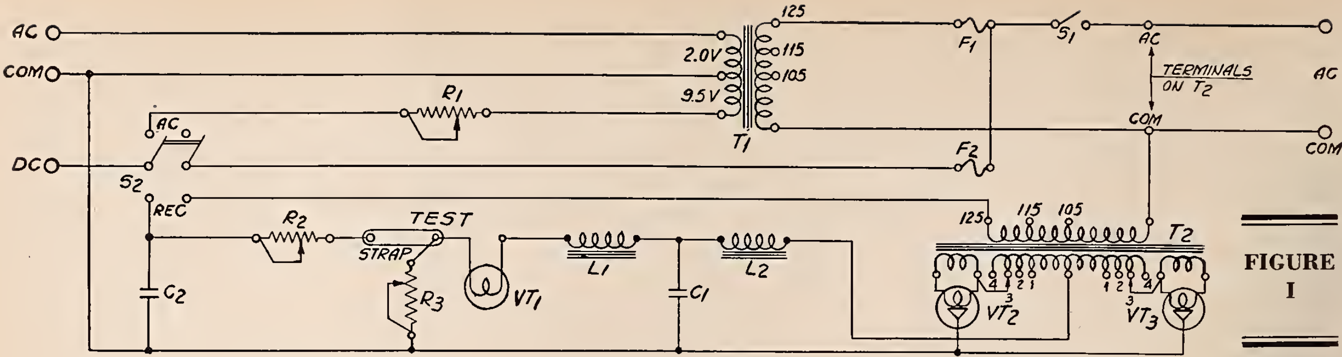


FIGURE I

aid in adjusting for proper output voltage and current.

The two-stage choke input filter is of the standard type using electrolytic capacitors. The question may be asked as to the reason for using choke input instead of capacitor input. A capacitor input filter always gives a higher input voltage to the filter than a choke input because of the property that a capacitor has of storing electricity when the voltage is high and releasing it as the voltage decreases.

Electrolytics, which are used widely for this type of filter, because of their more convenient size in the large capacities required for practical filter design, are not recommended for use next to a rectifier tube. They are used in choke input filters, the first choke smoothing out the ripples before they reach the capacitor. Thus, it does not have to work as hard. Capacitors C_1 and C_2 are 2000 and 50 microfarads, respectively. Such capacitors in any other type would be too large for practical design.

Automatic Output Control

The rectified AC from the tungar bulbs, in passing through the filter units L_1, L_2 and C_1, has its ripples smoothed out so that it becomes direct current with only a slight ripple. It next passes through VT_1, the automatic current regulating device. This is commonly known as a ballast lamp or ballast tube. It consists of a filament of special wire in either an evacuated envelope or one filled with an inert gas. The envelope may be either of glass or metal and the base may be provided with prongs to fit a standard four-prong socket, or it may be of the screw base type to fit a receptacle similar to those used for fuses.

Ballast lamps, generally, are designed to operate in a constant current circuit and with a specified upper and lower limit for the voltage drop across the lamp. Within these voltage limits the characteristic of the filament wire is such that the current change is a very small percentage of the voltage change. In other words, as the voltage at the right hand terminal of VT_1 rises, the resistance of the filament increases rapidly, the voltage drop across the lamp increases at the same rate, and the current through the circuit—the load being constant—remains practically constant.

The ballast lamp is designed to compensate for fluctuations in line voltage. The taps on the primary of the rectifier transformer are used to adjust for average line voltage during the operating hours of the equipment but, if during certain periods, the load on the generating is particularly heavy or suddenly becomes light and the voltage drops or rises, the exciter lamp current may be expected to vary accordingly. One will affect the gain of the system, while the other will shorten the life of the lamp, if the ballast lamp is not used.

The particular lamp used in this power unit is designed for a drop of from 7 to 13 volts across it and a current from 4.1 to 4.3 amperes through it. Below 7 and above 13 volts the ballast characteristic does not apply, the change in current being roughly in proportion to the change in voltage.

Adjustment instructions for this power unit call for a drop of 10 volts across the lamp and a current of 4 amperes through the load circuit. The slightly higher current rating of the lamp allows for the current dissipation through the rheostat R_3. This voltage setting is in the middle of the operating range of the lamp and when it is so set the lamp will compensate for variations in line voltage of ±10%. These lamps dissipate a considerable amount of heat. but the filament does not glow when operating normally. If, however, a small amount of air leaks into the envelope, the filament begins to glow and its life is very short.

To adjust for 10 volts across the lamp and 4 amperes through the load, a DC voltmeter is connected across the ballast lamp. Convenient terminals are provided in the power unit. and a DC ammeter is connected in place of the strap designated "TEST" in the figure.

In actual practice the ammeter is first connected and then the strap opened, thus avoiding opening the circuit. Rheostats R_2 and R_3 are then adjusted until the above values are obtained. R_2, being in series with the load, is primarily to compensate for variations in the resistance of the run from the power unit to the exciter lamp. It also takes care of any slight variations in the ballast lamp or other components of the circuit. R_3, on the other hand, affects the current through the ballast lamp with less effect on the load current.

Power Unit Regulation

It has previously been noted that, in the operating range, a change of 0.2 amperes corresponds to a change of 6 volts. This latter rheostat, therefore, gives the finer adjustments required to establish the current and voltage values given above. Actually R_2 should first be adjusted for 4 amperes, and then R_3 until a 10-volt reading is obtained. Slight readjustments of each may be required until proper readings are obtained, as the movement of one rheostat has some effect on the other circuit. R_3 has a stop which limits the amount of resistance that can be cut out, and thereby prevents short circuiting the output of the unit.

In making adjustments a short time should be allowed between successive movements of the rheostats as there is a slight thermal lag in the filament of the ballast lamp. This is evidenced by the slight drift of the meters after the rheostats have been moved. During these adjustments the taps on the secondary of the rectifier transformer come into play. It is desirable that both rheostats be approximately in midpoint after the adjustments have been completed. If one or both are in either extreme position the tap on both halves of the secondary of the transformer should be changed, either up or down as required, and the procedure repeated. As previously stated these secondary taps are for the purpose of taking care of slight differences between the primary tap setting and the actual average line voltage and also any variations in the components in the unit, so that adjustments may be properly made, and also so that the desirable position for the rheostats, referred to above, may be arrived at.

It will be noted that the current drain through the shunt rheostat R_3 is small

(*Continued on page 26*)

Local No. 302, Calgary, Alta., Canada, Aids In Training Ex-Service Men

By *DUNCAN G. HENDERSON*

The accompanying article interestingly details how I. A. Local Union 302, Calgary, Alta., Canada, is training Canadian ex-service men in the art of motion picture projection as a part of a governmental rehabilitation program. This plan has the full support and cooperation of the local, the opinion being that it is an excellent means of training apprentices according to the high standards of projection set up by the government. The writer of this article, Duncan G. Henderson, member of Local 302 and a first-class projectionist of over twenty years' experience, teaches the students the principles of optics and projection in general. Robert Kirkham, also a member of Local 302, instructs the students on sound.

THE motion picture projectionists' course conducted by Local Union 302 is the outcome of a plan on the part of the Dominion and Provincial governments in Canada to aid ex-service men who have returned from the current war in preparing themselves for a profession that will be of benefit to them in their future civilian life. In connection with this course the Alberta Provincial government amended, by order-of-council, the regulations governing third-class projectionists' certificates, which is detailed at the end of this article.

Our local has given full support to the course, one reason being that aside from aiding in the training of ex-service men for a self supporting civilian life, support of the Government's plan would not only relieve the shortage of projectionists, but would be a means of training apprentices to the high standard of projection as set up by the Alberta Government's Examination for projectionists in electricity, optics, projection and sound.

Previous to entering our course as students the apprentices complete a six months' study in electricity at the Western Canada High School in Calgary. Our studies for projectionists also covers a six months' period, with a thorough technical and practical grounding being given.

Basic Subjects Covered

Four basic subjects covered in our course are as follows:

1—*Electrical:* Systems of transmission; sizes and insulation of wires and cables; theatre wiring systems; general grounding in generating, transforming and rectifying devices; transformers; rheostats and sound equipment, and their full care. Also, testing and tracing circuits for phase relationship, voltage, opens, shorts, grounds, etc.; connection of lamp circuits from source of supply through line resistance, motor generators, rectifiers, etc.; lamphouses, arc lamps, connections, faults and their remedies.

2—*Mechanical:* Specific knowledge of the machine parts, their uses, care, adjustments, and renewal of parts; studies of the various types of intermittent movements, their quality, care and adjustment. Also included are studies of machine safety devices, their action and adjustment, and the revolving shutter—its principle and application.

3—*Optical:* Projection lenses, their construction, selection, use, adjustment and care. Featured are the ability to secure and maintain clear field on the screen, and the ability to secure correct definition to properly mate and secure best results on the screen at a minimum expense. Condensers, types, mountings, adjustment, focusing, mating, etc., also come under this classification.

4—*Safety:* Knowledge of safety appliances connected with projection machines, apparatus, auxiliary safety appliances—their use and care—; construction of projection rooms; installation of electrical and projection equipment; ventilation, etc.

In connection with our course, the Dominion-Provincial war emergency training program authorities made arrangements with a theatre supply company in Calgary for the use of their projection and screening rooms. Our lectures are held in the screening room, the furnishings consisting of a blackboard, and tables and chairs for the students. The projection room is equipped with two projectors in addition to sound equipment.

We feel that we were fortunate in securing the use of the projection room from the supply company for it has ample supplies of equipment on hand, from old Powers projectors to modern Motiograph and Simplex machines. They also have an extensive supply of amplifiers, transformers, rheostats, etc., in addition to a fine workshop where equipment may be overhauled.

Instruction hours are from 9 a. m. to 12 noon, and from 1 p. m. to 3 p. m. from Monday to Friday. In addition to various textbooks on projection we refer from time to time to articles appearing in INTERNATIONAL PROJECTIONIST. There usually is about two hours practical projection work under the personal supervision of the instructor.

Following the six months' course students receive practical training for one month in a theatre open to the public, under the supervision of a first-class projectionist. Upon completion of their studies students are examined by the Chief Inspector of Theatres in Alberta for a third-class license, and we feel, with the thorough training they receive, they will turn out to be qualified projectionists and a credit to the International Alliance.

The amendment by the Alberta Provincial Government of the regulations governing third-class projectionists and referred to earlier in this article, reads in part:

NEW REGULATIONS

Whereas the Dominion-Provincial War Emergency Training Program covers a student's course of instruction and training in respect to the operation, care and maintenance of motion picture equipment: and whereas it is deemed advisable to

(*Continued on page* 10)

(Left to right) Robert Kirkham and Duncan G. Henderson, Instructors.

Discuss Theatre War Hazards at S.M.P.E. Meeting

WAR hazards furnished the principal topics discussed at the February meeting of the S.M.P.E., Atlantic Coast Section, held at the Hotel Pennsylvania in New York City. The gathering was opened by Dr. Alfred N. Goldsmith, chairman, who introduced the speakers.

Discussing fire-fighting equipment in theatres, E. W. Fowler, engineer, National Board of Fire Underwriters, said that it is desirable to have suitable equipment for fighting incipient fires both in time of peace and war, and emphasized that the possibility of air raids adds to the importance of having suitable equipment on hand. This should cover both building and incendiary bomb fires. Mr. Fowler considers water or water solution types of extinguishers as being most appropriate for ordinary conditions in theatres. He also said that theatre employes should be organized and trained in handling the fire extinguishing equipment.

Dr. Walter Cutter, coordinator, Center of Safety Education, New York University, talked on "Group Panic and Its Control," declaring that in order to understand the occurrence of panic in groups it is first necessary to understand the nature of a group. "The sources of the fears which lead to panic undoubtedly are many," he stated, and detailed them, continuing that "the central problem in combating panic is to drain off the panic elements and restore 'normalcy' or 'usualness.'

"There is a psychological moment, as panic is gathering, when, if the proper direction is applied it may be averted. This takes a strong, assured type of individual. Music of certain types, played instantaneously, may help avert panic. The teaching of people to expect constantly the unexpected is a long-time partial solution, but there are certain devices which can be used to help out in emergency situations. Special emergency devices can be 'standing by,' such as particular types of moving pictures, special music, the use of trailers, etc. The overall clue to panic avoidance is to take every reasonable and even extreme precaution to prevent it, but to be ready to head it off instantly when it comes."

The subject of emergency lighting was discussed in detail by Earl Morin, of the Connecticut State Police, who said that as a war measure the department directed all theatres to provide some sort of auxiliary lighting. He described an automatic system that was evolved for the emergency. "Due to the fact that all such devices need some attention," he went on, "such as keeping water in the battery, it was decided to have this equipment placed in a projection room where it would be under the watchful eye of the projectionists."

The system described, Morin said, is sufficient for the average size theatre, furnishing sufficient light so that patrons would be able to see their way if they desired to leave the theatre, and would afford sufficient light to keep them calm. At the conclusion of his address Morin exhibited the automatic device.

Gilbert F. Tyler, safety engineer, Pan American Airways, who spoke on "Theatre Glass in Wartime," brought out the fact that various types of glass appear to be resistent to breaking in this order: tempered polished plate glass; laminated safety glass, and wired glass. "Except by the use of tempered glass," he stated, "we have found no method of eliminating the danger from fracture of plate glass under blast effects.

"Sodium silicate or water glass and animal or fish glues applied to glass will chip off the surface of the glass and destroy its transparency. Plate glass should not be painted with opaque paints, for experience has shown that the heat absorbed by these paints from sun rays will crack the glass. No protection of which I have knowledge is positive and the most constructive measures are those directed toward eliminating plate glass from important exit ways, stairways and places where people may be assembled in large numbers."

Among the other speakers were Ben Schlanger, consulting architect, who discussed "Theatre Construction in Civilian Defense"; James Frank, National Theatre Supply Co., whose subject was "Luminious Materials," and Henry Anderson, manager, Insurance Department, Paramount Pictures, Inc., who spoke on "Flame-proofing of Fabrics."

NEW REGULATIONS

(*Continued from page 9*)

amend regulation 76 (*c*) to recognize this course of instruction and training as a preparatory one for an apprentice.

Therefore, the Honorable the Administrator, by and with the advice of the Executive Council, has been pleased to order that the said regulation 76 (*c*) be and is hereby amended, by deleting the said regulation and substituting the following:

76 (*c*) Third-class certificates: the applicant for a third-class certificate must (*a*) have served an apprenticeship period of at least six months projection room service on standard 35 mm. equipment, either as the holder of an apprentice license in Alberta, or elsewhere as an assistant to a projectionist, or (*b*) have duly completed the student's course of instruction and training provided by the Dominion-Provincial War Emergency Program and qualified under the same. Provided, however, that the final month of the course of such student shall, subject to the Provision of Regulation 74 hereof, be served in a projection room on standard 35 mm. equipment in operation during the time a theatre, public hall, building or place of amusement is open to the public.

Instructor Henderson and projection students J. Williams and W. F. Innocent.

LIFE BEGINS AT 40th ANNIVERSARY FOR P. L. THOMSON

Life begins at the 40th anniversary for Philip Livingston Thomson, Western Electric public relations director, who recently completed four decades of service with the company. He established a record without parallel in the industry by directing the advertising affairs of the organization for 32 years.

Thomson was among the first to achieve and utilize institutional advertising in the industrial field. Another of his pioneering accomplishments was the use of both silent and sound movies for institutional advertising purposes. In 1938 he received the annual Gold Medal awarded for outstanding achievements in advertising.

THREE STARS FOR BAUSCH & LOMB

A third star was placed on Bausch & Lomb's Army-Navy pennant on Feb. 3, each representing six months of outstanding performance in producing optical equipment for the armed forces. A brochure "Bausch & Lomb at War," is a pictorial presentation of the company's record on which the awards were made, incomplete, however, because censorship did not permit disclosures of all activities.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random; fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Correcting Troubles in WE-203 Type Non-Sync.

If the turntable motor will not start, or after starting runs double speed, check for grounded section of capacitor. I recently had this trouble develop and found that it was caused by metal filings and carbon dust lodged between the capacitor terminals and capacitors (which are grounded).—EMIL DE NEUF, *RCA.*

Improving Operation of Simplex Soundheads

Recently a rotary stabilizer in the Simplex soundheads was found to take a considerable length of time to come up to speed and the music was garbled for fully a minute after the changeover was made. The stabilizer assembly was in perfect condition. The trouble was corrected by increasing the tension of the pressure roller on the stabilizer drum. This was done by removing the pivot pin on the upper arm and the ball bearing and tension spring. The spring was stretched 1" and the assembly replaced. Increased pressure caused the film to accelerate the stabilizer to full speed in normal time.—L. P. CONNETT, *RCA.*

Protecting Wiring on RCA Photophone Soundheads

A successful method of eliminating oil from the lead wires on the drive side of the MI-1040 Series is as follows: Remove housing, stabilizer, and oil shield. Using several folds of cloth or absorbent cotton to cover the top between transformer and stabilizer housing, drape it down over the wiring and front of transformer. The shield, stabilizer and guard are then re-installed. The cloth should be checked occasionally and replaced when it begins to become oil-soaked.—G. H. HINES, *RCA.*

Emergency Repair

A wartime emergency repair for an open-circuited motor field winding was made recently and the motor is still operating satisfactorily. The d.c. resistance of each field coil was carefully checked, after finding which coil was open-circuited. The resistance from each end of the coil was checked by using a needle which pointed prod up to the point of the open circuit; readings increase as the point of open circuit is approached. Totalling the resistance of each section found gave approximately the average resistance of other field coils. At the point found on each section where maximum resistance was found, the turns were cut and scraped clean and then soldered, completing the continuity of the field coil. Since not more than two or three turns would be lost by this method of repair, the motor will operate with very little increase in temperature. The tape around the winding was readily removed by swabbing it with a lacquer solvent which loosened the tape sufficiently to permit it being pulled off, thus exposing the winding.—D. W. MCMILLIN, *RCA, Chicago.*

Protecting Projector Lenses

An ice box dish cover made of oiled silk (purchased at any 5 and 10 cent store), can be used for protecting a projection lens by putting it on the exposed end of the lens at night, thereby keeping it clean and free from dust.—F. W. HAMRE, *RCA.*

Stripping Metal Covers From Carbon Stubs

To the projectionists who have made a practice of removing metal covers from carbon stubs by stripping with knife, etc., I make the following suggestion: Place the carbon stub horizontally in a small vise with pressure applied, causing the metal coating to burst top and bottom. When released from the vise it will be found that the carbon has been split into quarters and practically falls clear of the metal. I have found this method to be a great time saver.—V. A. SCHOOLEY, *LOCAL 316, Miami Beach, Fla.*

Line Voltage Variation in Theatres

Recently a complaint was received on unbalanced sound between machines. Investigation proved that when the tungar lamp house rectifier for "A" machines was turned on, the volume would raise six points above normal; when both rectifiers were on prior to changeover, volume would drop to below normal. Line voltage checked across each side the line was 117 volts without rectifier load; turning on rectifier would cause a drop of ten volts on the line side rectifier to which it was connected. and raise the voltage on the opposite side. With both rectifiers on, line again would balance. This line drop condition was traced to a point where lines entered the theatre. The local power company was called in and after three days of checking they discovered that the trouble was due to a loose connection in the watt hour meter of the neutral wire. Tightening of this contact immediately corrected the trouble. —H. E. FRISBIE, *RCA, Pittsburgh.*

Conservation of Arc Lamp Feed Motors

For proper operation of arc feed, the commutators of these small motors should be frequently polished with crocus cloth. This will also prolong the life of the motor by limiting the arcing at the brushes to a minimum. Where examination shows the commutator to be grooved, the motor should be dismantled, the armature removed, and the commutator turned down in a lathe. If an electric drill is available this may be done by placing the armature in the drill and carefully holding a small fine file on the commutator while the drill rotates it. Finish the job with fine sand paper and polish with crocus cloth. Finally, undercut slightly the mica between the commutator segments.

A very small amount of vaseline may be applied to the commutator. Place a little vaseline in the palm of one hand and rub it in with a finger of the other hand. If the finger appears to be only shiny, sufficient vaseline will be present to apply to the commutator.

While dismantled, the bearings of the motor should be examined for wear and proper lubrication. On ball bearing type motors, the bearings should be washed in carbon tetrachloride and then oiled thoroughly with a good grade of light oil (manufacturers recommendations should be followed where any special type of bearings are used). — CLIFFORD D. WELCH, *RCA, Pittsburgh.*

Anchoring Wood Screws

Many methods have been tried to "plug" wood screw holes when the screws have pulled out. A simple remedy is to stuff the holes in the wood with ordinary steel wool and then re-drive the screw. This has been a definite solution to an otherwise seemingly hopeless problem.—C. R. SHEPARD, *RCA, Pittsburgh.*

In The

SPOTLIGHT

By ***HARRY SHERMAN***

IF Eddie Rickenbacker continues with his harangue of labor in this country, he will find himself as popular with our people as his contemporary, Charles Lindbergh. We all know of Rickenbacker's anti-unionism—it is an old story to those who have followed his career in the aircraft industrial world. Now is hardly the time to vent one's spleen on labor, no matter how well-meaning one's intentions may be. Quentin Reynolds, famous war correspondent, had this to say regarding Mr. Rickenbacker's outburst against labor:

"I understand that it has lately become quite popular around here to give labor a kick in the pants. I don't know how many plants Capt. Rickenbacker has seen. But I know that I've seen at least 30 since my return to the United States several months ago, and I've seen hundreds of plants in Russia and England, and in other spots on this globe. And I say that nowhere in the world is labor digging in and working as hard as it is right here in America."

It seems to us that Eddie is trying "to make with the big talk in a stuffed shirt."

● Weekly parties for men serving with the armed forces are sponsored by Buffalo, N. Y. Projectionists Local No. 233, under the leadership of Bert Ryde and Ben Pinzel, and Stage Employees Local No. 10 under the guidance of Danny Gill and Bill Schaeffer. These parties are held at the Memorial Auditorium in Buffalo, and the only price of admission is a service uniform. That's showing the good old American spirit!

● The dues paying membership of the American Federation of Labor excells 6.000,000, according to a statement recently issued by George Meany, secretary-treasurer of the organization. As of January 1943, reported Mr. Meany, the membership of the A. F. of L. totaled 6,194,382—and this figure does not include the several hundred thousand members now serving with the armed forces and who are excused from paying dues for the duration.

● Did you know that reels can beat lamps? That lenses can whip sprockets? That projectors can maul gears? Well, if you want further information on the subject, get in touch with the secretary of Local 325, Wilkes-Barre, Penna. Members of Local 325 have formed a bowling league, and the teams are named Lamps, Gears, Lens, Sprockets, Reels, and Projectors. According to last reports received by this department, the Sprockets were in the lead, with the Gears in last place.

● Ben Hull, president of Local No. 186, Springfield, Mass., has been re-elected president of the Springfield Central Labor Union.

● Some time ago we mentioned that Jack Hill, son of Harvey Hill, business agent of Local No. 249, Dallas, Tex., was one of the first I. A. men to enlist with the armed forces. Jack has recently returned home to recuperate from wounds received fighting on the African front. We understand that he is now well on the road to recovery and should be feeling fit again in short time.

● Harry B. Braun, member of New York City Local No. 306, and director of sound at Radio City Music Hall, is now Lt. Braun of the United States Navy. Harry has promised to write an original article on sound for the readers of I. P., his naval duties permitting, of course.

● Local No. 316, Miami, Fla., recently held their election of officers with the following results: H. A. Joslin, president; R. E. Lewis, vice-president; Joe A. Campbell, Jr., corresponding secretary; C. M. Boyd, recording secretary; Victor S. Schooley, treasurer; George E. Raywood, business agent; E. French and Wm. S. Roberts, board members; and Jack Shafer, Frank Raufer and L. C. Webb, trustees. Congratulations and best wishes for a successful administration.

Harry Sherman

● International Representative Frank Stickling supervised the election held last month by Local No. 143-A, St. Louis, Mo. The newly elected officers are Elmer Sims, president; Frank Casey, vice-president; Lawrence Parker, secretary; Clarence Brown, treasurer; Lancaster Bryant, business agent; Julian Roden, board member; Fred Hall, sergeant-at-arms; Lawrence Whitson, Clifford Newton and Columbus Ewing, trustees. Local 143-A was organized in 1935 and has been making steady progress.

● Frank C. Jiruska, secretary of Cedar Rapids, Iowa Local No. 191, advises us that Dick McIntyre, former president of Omaha, Nebr. Local No. 343, is now serving with the naval forces as an instructor in the installation of 16 mm sound and projection equipment.

● Stanley Anderson was re-elected president of Local No. 457, Superior, Wis. E. G. Austin, former secretary, is now the business agent, and Ralph Pink has been elected recording secretary. Austin was a delegate to the last I. A. convention, held in Columbus, Ohio, and was one of the busiest men on the scene.

● To all locals and members of locals who have written to this department anent the 10% increase granted to projectionists working in various projection rooms in New York City, please be advised that the WLB *did* sanction the increase. As a matter of fact, most of the retroactive money has already been spent.

● Another would-be "labor dictator" has arrived on the scene in the person of State Senator H. B. Hart, of Missouri, who is doing his utmost to make a gestapo of the labor unions in that state. He has proposed a bill to regulate all labor unions, and recommends the following conditions upon which a man may hold office in any local union in the state of Missouri: (1) *He must be a native born American,* (2) *He must be a resident of the state of Missouri for at least five years,* and (3) *he must be the owner of real estate property.* Senator Hart also invites all union members

to inform him of any complaints they may have against their respective union officials. Unfortunately, there are always to be found a certain number of disgruntled union members who are only too willing to pour their tales of dissatisfaction into the ears of those who might care to listen. Evidently the worthy Senator has appointed himself "comforter" for these men. It is strange about these so-called rebels—they will go to almost any lengths to obtain membership in a union, and once they are accepted, then the complaints fly thick and fast: The union fee is too high—the business agent's salary is too large—the membership is not getting a square deal, etc., BUT, if he (the newly elected member, we mean) were given a chance, he would show the membership how a local union really should be run. Make way for "Little Caesar!"

● Arthur Martens, the popular president of Westchester County Projectionist Local No. 650, flew about 5600 miles on the Eastern, Panair and American air-lines during a recent trip to Mexico. Arthur planned the trip as a rest cure, but instead he ran smack into the earthquake that shook up the Mexican countryside quite a bit. Despite the fact that he didn't get his much needed rest, Arthur roars with laughter when telling of his experiences in that country during the upheaval. We should like nothing better than to go off on a jaunt with a guy who possesses such a swell sense of humor. Is it a date, Arthur?

● Louis Hammond, projectionist at the Strand Theatre, Brooklyn, N. Y., is the possessor of a watch given to him in 1912 by Franz Joseph, Emperor of Austria. Lou ran off the first motion pictures to be shown the late emperor, and is extremely proud of that distinction.

● We have just received a letter from Alfred Criswell, member and former secretary of Local No. 171, Pittsburgh, Penna., in which he sets us right as to the nature of his duties with the War Manpower Commission. Al writes as follows:

Dear Harry,

It has been many, many years since I have had the pleasure of speaking with you, and I certainly was amused by your reference to me in your column in the January issue of INTERNATIONAL PROJECTIONIST.

So that this matter may be made clear to you, I am enclosing herewith two booklets outlining the Training Programs being sponsored in our war industries by the War Manpower Commission. We can only judge the effectiveness of programs of this kind by the 'end results' and they have been really amazing in helping to increase production in our vital war industries.

My official title is 'Technical Training Specialist' and it is part of my job to institute and conduct these programs. Local No. 171 has started classes for its membership in Job Instructor Training, because it was felt that such training would add to the ability and rating of the members, if it should come to pass that they would be required to take their places in war industries.

I am also enclosing a copy of a resolution passed at the last meeting of Local 171 which, in my opinion, might well serve as a model for other locals wishing to insure their members adequate protection during the national emergency. I hope the material enclosed will prove of interest to you, and you may feel free to use any part of it at any time.

Kindest personal regards,

Fraternally yours,
AL L. CRISWELL,
Local 171,
Pittsburgh, Penn.

The aforementioned resolution will appear in a forthcoming issue.

● Lou Clendenning, who served as a machine gunner in the Navy during World War No. 1, and who, upon his discharge from the Navy was elected president of Atlantic City Stage Hands Local No. 77, has served that office ever since without pay. Lou is now serving in another honorary capacity, having just passed his 1400th hour as a member of his rationing board.

● Secretary of Labor Frances Perkins reports that between August 1939 and December 1942 the cost of living has increased 22%. Motion picture theatre owners acknowledge the general increase in basic commodities by boosting admission prices at their theatres—but they completely overlook the fact that the man working in the projection room, the man upon whom the exhibitor depends to present his offering to the paying public—has to meet the same rise in living costs. Truly, the projectionist is the forgotten man where the exhibitor is concerned.

● Eddie Miller, I. A. representative, has been re-elected business agent of Houston, Texas Local No. 279 for the twelfth time. Other officials elected are Charles Smith, president; Jess Hogue, vice-president; Walter Kunz, secretary-treasurer; Frank (Bumps) Coogler, assistant business agent, and Lew Evans, recording secretary.

Recently every I. A. man wearing one of Uncle Sam's uniforms and in the jurisdiction of the Houston local, was presented with a $10 check by Local 279. Although 279 has a membership of only 53 men, it has already purchased over $30,000 in War Savings Bonds. Not bad going, we say.

● Perhaps the drip-saving and carbon-peeling days for projectionists have come to an end. An attachment that eliminates the need for the copper covering of the positive carbon used in projection lamps has been perfected by Max Munch, member of New York City Local 306. The device is small but durable and can be permanently attached to all arc lamps very easily. According to Munch, this attachment is very timely and would save tons of copper yearly. It has been successfully demonstrated and tried out in a number of theatres, and has won the unanimous approval of all who have used it.

● We might have been considered a bit rough last month when we spoke of Harry Brandt, of the Brandt Circuit, as a frustrated labor baiter. However, the following story which appeared in various forms in the trade papers bears out

(*Continued on page* 25)

WE were deeply affected to learn of the recent death of Wayne G. Woods, for many years secretary of Local No. 162, San Francisco, Calif. Woods originally organized the local in 1904, but it was dissolved in 1906 at the time of the San Francisco earthquake. However, he returned in 1907 and re-organized the motion picture projectionists, and in 1909, with the aid of Les Dolliver, he obtained a charter for Local 162. That he was held in high esteem by his membership is attested to by the memorium drawn by the local and which reads in part as follows:

For many years Brother Wayne G. Woods took an active interest in the affairs of this Local. . . . He faithfully served us as Organizer, President, and General Secretary-Treasurer. Naturally alert and interested in our affairs, he took his part with other members in the successful building of San Francisco Motion Picture Operators Local No. 162. However, the outstanding feature in his services to us was his devotion to the cause of the man who toils. . . . The cause of labor, the ideals for which laboring men may legitimately aspire found sympathetic zealous support in the heart of Brother Wayne G. Woods. His aggressive espousal of the cause of Labor placed him in a position of leadership in Labor's cause. . . . We may well claim for him a high place of appreciation in our memory. . . . Brother Woods left a vacancy with us hard to replace. We lost one of the pillars of our organization, one whose judgment was greatly appreciated. We mourn his loss. May he rest in peace.

To which we say "Amen."

That I.P. Contest Question on Two-Way Dividing Networks

WE WISH that all of you could have an opportunity to study the answers to the contest questions each month. They show far better than words can the ingenuity possessed by projectionists. They certainly are prepared to cope with the unusual emergencies that are arising and that will become more prevalent as the war continues. The January question was far from simple but was handled capably by a majority of the contestants. We have to admit that a few missed one important detail that would have led them into more serious trouble than covered by the mere wording of the question.

Two-way dividing networks, as the name implies, are for the purpose of selecting certain bands of frequencies for transmission to the high and low frequency speakers used with such a network. Such speakers then are especially designed for most efficient operation over these bands of frequencies. In practice, however, it may be said that certain types of speakers are developed for operation over a definite frequency range. Beyond this range their efficiency either drops or they may be damaged. Thus the proper type of network and the proper speakers must be selected for operation together.

Frequency Selection by Networks

When we speak of a network selecting frequencies, it does not mean that there is no signal transmitted through the low frequency leg of the network above crossover, or conversely, that no signals pass through the high frequency leg below crossover. The term "crossover" refers to the frequency at which the signal power is equally divided between the high and low frequency speakers. This term, no doubt originated in the laboratory for if the response (power compared with frequency) is plotted as a chart, crossover is the point at which response curves of the high and low frequency legs of the network cross. Another word for crossover is cutoff. The cutoff of this type of network is not sharp; that is, the signal through the low frequency section does not cease nor does the signal begin just at that point to pass through the high frequency section. There is a gradual decrease in the signal through the low frequency section above crossover and a gradual increase in the signal through the high frequency section below crossover. In the laboratory this characteristic is expressed as attenuation in so many db (power loss) per octave (the frequency doubles every octave).

Thus if we start with the lowest frequencies reproduced by a sound system, these signals are all reproduced through the low frequency speaker. As the signal frequency increases, a point is reached at which a small portion of the signal passes into the high frequency speaker. This portion increases until at crossover, as pointed out above, one-half of the signal passes through each speaker. Above crossover the signal passing to the low frequency speaker decreases at a definite rate as the frequency increases until it reaches zero and the total signal then passes to the high frequency speaker.

High frequency speakers are not designed to reproduce low frequency signals and must be protected from them or suffer mechanical damage. Thus we come to the function of the high frequency leg of the network. It must reduce the frequencies below crossover to a level that will prevent damage to the speaker. Also, neglecting mechanical damage for the moment, this type of speaker will not reproduce low frequencies satisfactorily.

The low frequency unit, on the other hand, always gives the appearance of being more rugged, as indeed it is intended to be. The amplitude of the low frequency signals is much greater than that of the highs and for faithful reproduction the diaphragm of the low frequency speaker must follow these signals. This means a much greater movement of the diaphragm and it is this movement that damages the diaphragm of the high frequency speaker. Since low frequency speakers are designed for

Announcing
A Test of Skill and Wits

KNOWLEDGE of projection, skill, and resourcefulness in meeting unusual conditions arising out of the war feature this novel contest, which is open to all practicing projectionists. Fancy writing, skill of presentation, win no prizes; prizes are awarded solely on the basis of how well the contestant has met the problem presented. The editorial staff of I.P. are the sole judges, and their decisions are final.

The following prizes are offered *each month*:

First Prize . . . . ***$10.00* in War Stamps**
Second and Third Prizes . . . . ***$5.00* in War Stamps**
Next Six Best Answers . . One Year's Paid-up Subscription to I.P.

Additionally, at the end of the contest, there will be awarded for the most consistent showing a

Grand Prize . . . . ***A $25.00* War Bond**

All answers must reach this office by the tenth day of the month following publication of the question: that is, all answers to the March question, published below, must reach I.P. by April 10.

Now here is the question for March:

Your sound system has developed a loud "crackling" and "popping" noise, so loud that the show cannot continue until the trouble is cleared. It is impossible to obtain service for several days and you must find and cure the trouble yourself. Describe just how you would proceed to locate the cause and how you would repair it.

Apply this question to your own equipment, your own projection room. It's your problem, you have to solve it; there'll be no show till it's solved.

For the most ingenious and *practical* solution you win $10.00 in war stamps and a running start toward the Grand Prize $25.00 war bond.

the high amplitude of the low frequency signals, it follows that they do not respond to the comparatively low amplitude of high frequency signals. They do not follow these signals, cannot vibrate rapidly enough, and consequently the signals are lost.

The above pretty well answers the question as why more than one speaker is required to reproduce frequencies faithfully from 50 to 8,000 cycles. There are a number of full range speakers on the market, but as far as we know they do not come up to the requirements for theatre use. Speaker development over a period of years has resulted in an extension of the range of both low and high frequency with the result that the three speaker combination which was once used is now unnecessary. Low frequency speakers can be used directly across the line without damage, but since they do not respond to the higher frequencies, reproduction will lack the brilliance and sibilance that lend quality to sound.

Missed the Point

Several contestants missed the point that high frequency speakers cannot be operated directly across the stage speech line. They proposed, in various degrees, to connect them in parallel or in series with the low frequency speakers in case of failure of the high frequency leg of the network. This was to be done in some cases by direct connection, in other cases by short circuiting an open capacitor in series with the high frequency speaker. A lone contestant proposed to leave a short circuited capacitor in the high frequency leg without any protection for the speaker. Still another contestant proposed, if we interpreted his answer correctly, to connect the high and low frequency voice coils in series, with an 8 to 16 mf capacitor across the low frequency voice coil. We assume that this combination is to be connected directly across the stage speech line. This means that all frequencies flow through the high frequency voice coil and out goes the voice coil when a low frequency signal hits it. Since the impedance of a capacitor increases as the frequency decreases, 8 to 16 mf across the low frequency voice coil serves to bypass the high frequencies which would not do any harm anyway. A reactor (or choke coil) of proper value across the voice coil of the high frequency speaker would have protected this unit, since the impedance of a choke coil decreases as the frequency decreases. This characteristic would bypass the low and damaging frequencies from the high frequency speaker.

In assuming the failure of a high frequency unit another contestant has proposed as a last resort to improvise a high frequency horn complete. He proposes to use one or two six- or eight-inch cone speakers, construct a plywood flare baffle and mount these units in it. We assume that he would obtain a radio type of cone speaker. If this is so his low frequency horn alone will give him just as good quality without all of that trouble. Furthermore, the low frequency speaker units normally used in theatre systems are twelve to fifteen units and should give better overall response than the small units.

We suggest that he describes a lot of work with not much gain. In fact the whole thing could be nullified if he did not happen to design his flare baffle correctly. There is a definite relationship between the type of unit to be used and the design of the horn. A good deal of the theory involved has been well established, but we understand that some testing is still necessary to arrive at the ultimate most efficient design. Now, if this baffle were, perchance, very incorrectly built we have been lead to believe that rather queer tones will come from it and the patrons would not appreciate this modernistic music.

Again the possibility of using other components of the system has been brought to light. In the balanced type of network, where the impedance of both legs is the same, the same components may be found to occur in both sections. Defective components in the high frequency section may then be replaced by those from the low frequency section and the low frequency speaker connected directly across the line, or other suitable units added to keep some of the highs out of the other speaker. In this way cleaner, better quality sound will be obtained.

In most networks there are resistors in the high frequency section which may be adjusted to reduce the highs passing through the high frequency unit. This is commonly called balancing the speaker system. If this feature were not provided a preponderance of highs would be evident in some auditoriums, this depending upon the acoustic properties of the theatre.

Unpleasing quality results from an excess of highs and this can not be remedied in every case by changing the frequency response of the system. These resistors actually lower the high frequency response throughout the range of the high frequency leg of the network and will, in combination with the adjustment of the response of the system, give best results.

Contestants have referred to the necessity for making such an adjustment if changes are made in the components of the network in case of emergency. This is a point which should be given consideration, but an effort should be made to maintain the same impedance as originally. In such an emergency crossover will probably change, but should remain well within the range of efficient operation of the two types of speakers.

Gilbert Clement, the first prize winner, has not taken for granted that the high frequency section is inoperative, but has proceeded to make sufficient tests to be sure that the unit itself or its field supply are not defective. This procedure would have to be followed in practice to localize the trouble. The following are interesting quotations from his answer:

"I would like to suggest that each booth have on hand a few different size wires of various lengths with clips attached to each end. These could be used in an emergency for speeding repairs on circuits that need to be shorted out or to complete continuity. Such a jumper would come in handy in such a case as the one concerning the two-way speaker system. . . . With the amplifier running while the show is going, if necessary, I would hold some iron (pliers, screw driver, etc.) near the pole piece of the speaker field and if it is attracted by magnetic force the field is working properly . . . Suppose the field is functioning properly. Then I would connect the voice coil directly across the speech line by shorting the condenser in series. If the voice coil is defective we would have no signal." ***(For this test either a low level signal or only frequencies above crossover should be used to avoid possible damage to the voice coil.—Ed.)***

Maurice Rushworth, the second prize winner, likewise would check his field supply and the voice coil to make sure that the trouble is really in the network. He has some spare components in his network, as it was originally of the

(*Continued on page* 23)

Sound and Projection Equipment in War Department Theatres †

By *GEORGE L. BUB*

II.

THE stage loud speaker assembly, with which the engineer is next concerned, may be located in a built-in compartment, mounted on a stationary or roller platform, or mounted to a movable screen assembly. With respect to the wiring connections the engineer usually makes these himself, to be certain of phase and polarity relations, since colored wire schemes are not assumed to be correct. Here again he is assisted with cables, terminal strips, plugs, and receptacles from the installation kit.

With the stage equipment work planned and under way, his attention is then given to the auditorium seating, which may be either regular theatre chairs or wood benches. When regular chairs are to be installed he is usually called on to supervise the work. In such cases plans provide not only a detailed arrangement but methods by which the floor layout may be expedited. These methods include not only the location of the center of the arc of the front row of seats, which lies outside the rear stage wall, but also a simple method of transferring this arc to its proper position. A large *T*-square is made up to locate four row arcs at a time, and templates for each of the various widths of seats are used to spot positions of seat standards. For this work the installation kit provides electric hammers, drill points, and double-shielded anchor bolts with locking nuts. The organization of the balance of the work follows the usual conventional method.

Acoustic Qualities

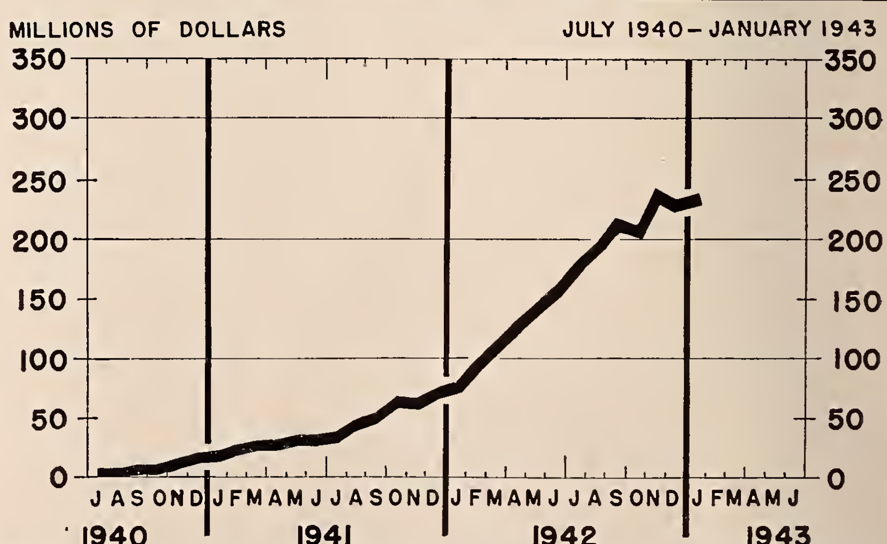
The next and probably the most important consideration on an installation is to secure the desired acoustical sound reproduction. Designed acoustical correction often falls short of theoretical expectancy due to variations in compliance with specified methods of installing different acceptable acoustical materials. Acoustic qualities of newly designed theatre auditoriums are always questioned. The acoustical characteristics of several of the various types of theatres were surveyed by the use of a warble film and a sound-level meter. These tests established the fact that data so obtained were subject to serious inaccuracies, largely due to the limited number of recorded frequencies at which readings could be taken. To secure the desired accuracy required to determine and correct certain observed conditions in auditoriums, a warble oscillator was developed.

This oscillator made possible the introduction into the sound system amplifiers of a warble tone, continuously variable over the entire frequency range. The warble was produced by a motor-driven condenser, the capacity of which was made to vary by means of a mechanical linkage in such manner as to maintain the width of the band of frequency modulation at a constant percentage of the fundamental, or midpoint, frequency. This was shown to be necessary if the same degree of accuracy was to be obtained in measurements at high and low frequencies. Three widths of warble bands were made available by adjustment of the linkage, making it possible to explore any band of frequencies very accurately, or less accurately, but in a shorter time by averaging the outputs over wider warble bands.

By use of this device acoustical characteristics could be taken in far less time than was previously the case with film. It is interesting to note that film tests often showed much greater differences in sound quality from point to point in an auditorium than listening tests indicated, while the oscillator usually showed differences of the order of those that the ear indicated as probable. While tests made with this instrument were very useful in determining the general nature of certain acoustical conditions and auditory effects, especially in the region below 1,000 cps, the time required to make a complete analysis of an auditorium made general use of the instrument impracticable. However, much that was learned by these tests is utilized in routine

† *J. Soc. Mot. Pict. Eng.*, Jan. 1943.

Government's Spending Rate in Global War



What it costs the United States government to conduct the war is graphically shown in the above chart, with the out-go for January, 1943, totaling $6,254,000,000, which was $129,000,000 higher than in December, 1942, and 185 per cent greater than in January, 1942. During January of this year the average daily expenditures were $240,500,000, while the daily rate for December was $235,600,000. The January 1942 daily rate was $81,200,000.

adjustments today.

In order to equip the engineer with a means of achieving the desired acoustical response, he is given information by which sound characteristics may be recognized and described. For each of the various characteristics of sound a chart provided a range of frequencies producing the characteristic and a series of mathematically derived and tested curves identified with the constants in a given circuit. Therefore, on an installation in a theatre, the auditorium of which appears to have the specified acoustical correction, the engineer proceeds with the installation on the basis that the acoustical properties are approximately correct. The amplifier is first checked and a characteristic curve taken with the calibrated frequency test-film and a meter across the correct loading resistor connected at the amplifier output terminals. The warping network is adjusted to the characteristic recommended by the Engineering and Maintenance Division. After a test run with the equipment properly connected and adjusted, the engineer sends with his report the characteristic curve together with his remarks as to quality of sound, connections made, and gain setting. Since the former tests were made in an empty auditorium, remarks are also supplied regarding the program, sound quality, and estimated attendance during a regular performance. In this manner the Engineering and Maintenance Division is provided with information by which a determination may be made on subsequent visits to the theatre as to whether circuit constants or gain have changed or whether adjustments have been made.

Of course, such work is more complex than indicated, as equipment does not always arrive in correct operating condition and defects do not always show up on preliminary tests. For example, in one case where an unsuitable amplifier-film characteristic resulted from in correct rotational adjustment of the optical system, it was necessary to provide an eccentric adjusting and clamping piece to replace the machined block designed to hold the optical barrel in correct rotational position.

Circuit Corrections Necessary

On almost every installation the varied local conditions create problems in the shielding of signal circuits, and the locating and connecting of effective ground wires. Especially on installations of the high-impedance input types of sound equipment, corrections to circuits become necessary because of interference pick-up of rangefinder signals as well as of various circuit-breaking equipment. Generally the solutions to such types of interference are found in the use of radio-frequency chokes and condensers located either at the point of pick-up in the signal circuit or by connecting a condenser across the contacts as close to the offending circuit-breaking points as possible.

The usual solutions to grounding problems are found to be first in the use of independent ground wires for equipment and signal circuits, as well as in securely bonding continuous shields at only one point to avoid ground-loop currents when two grounds are at different potentials. Engineers are usually aware that various grounds have various potentials, depending upon the size and length of the grounding wire, the resistance of points in conduits and waterpipe, type of soil, dampness and acidity, and depth of grounding coil or length of ground rod. In other cases excessive hum was traced to a clearance space in the exciter-lamp partition, which permitted a small beam of reflected light to project through the sprocket-holes of the film onto the photocell. With the possible exception of a few refinements, the remainder of the installation proceeds as usual.

In addition to initial equipment installations there is also the later necessity of replacing a portion of all sound and projection equipment in a theatre already in operation. An interesting feature of this type of work is the continuance of regular performances during the change-over. The usual "if possible" method of procedure is to clear conduits of all wire not to be used for the new equipment, relocate the original equipment so as not to interfere with the new equipment locations, and reconnect the old equipment in a "haywire" fashion.

Certain units of new equipment may be used in conjunction with units of equipment to be replaced. In one case this work involved moving the front wall of the projection room three feet forward on a balcony. The new front wall was erected but with large openings permitting projection from the original position of the projectors. The engineer and the projectionists were required to project each performance not only with different combinations of equipment, but also by means of different controls in different locations. The audience could not appreciate this, of course, since they were kept in the dark.

On other occasions equipment is transferred from indoor to outdoor theatres and *vice versa*, without interfering with continuous performances. In one instance the scheduled matinee performance in a new theatre was projected with equipment used the night before in the old theatre. A considerable amount of manipulation was necessary to transfer the equipment and wire it to meet the schedule, but it was done.

Installations made prior to the present emergency were scheduled as a portion of a servicing loop; however, the servicing loops now are smaller and are scheduled between installations. Nevertheless, the frequency of servicing visits to a theatre has been changed from four to six per year because of the extraordinary turnover of projectionists necessitated by military transfers.

Servicing of Theatres

Servicing visits were formerly planned in clockwise loops from St. Louis in order to cover a maximum number of theatres with a minimum of time and miles traveled. Engineers started on these loops in rotation at intervals of two weeks. The purpose of this plan to distribute engineers throughout the states is now generously provided for by the many and scattered installations. Every advantage must be taken of an engineer's availability between installations in order to maintain scheduled servicings. An engineer is usually allowed one day for servicing, although less time is usually taken when more than one theatre is in operation at a post. During each visit engineers are required first to satisfy reported irregularities in equipment operation since the last visit, then to

FIGURE 2

Projection Room instruction rack at the Engineering and Maintenance Division.

inspect, test, and repair all sound, projection, and miscellaneous theatre equipment, reporting unusual conditions encountered and the necessity and urgency for providing units, parts, or operating supplies; to instruct all projectionists in the operation and maintenance of the equipment, handling of the film, and fire precautions. Such instructions must be in the form of demonstrations.

Engineers, in addition to routine service work, also check ventilation, heating, and lighting equipment; resurface screens; dismantle arc generator sets to have the armatures turned down locally; repair seats, vacuum cleaners, and ticket registers; in fact, advise and report on any and all factors in connection with the theatre, its equipment, or its technical operation. In spite of the fact that a complete set of replacement tubes, lamps, and fuses, take-up belts, and brushes are on hand in each projection room, and that each engineer's kit includes repair parts usually required, it is on occasions necessary to wire the E. & M. Division for replacement units or parts. These units and parts are installed either by the projectionists or the engineer, depending upon the nature of the replacement and experience of the projectionist.

A necessary part of maintenance is the emergency call which, in some instances, is taken care of by a long-distance call made by the engineer nearest the theatre. Projectionists following through on engineers' advice either solve the difficulty or assist in isolating the unit causing the trouble, in which case the engineer wires the E. & M. Division for the necessary part. However, all emergency calls can not be handled in this way; for example, a wire from a theatre officer advised that all projectionists but one had been transferred, and he had three theatres to operate that night.

Other emergency calls have been equally unusual. In one case the difficulty was the result of crickets in a high-frequency baffle singing during the reproduction of a particular high frequency. Another resulted from mice gnawing away insulation, causing a short circuit. Repetition of a case of noisy reproduction was caused by vibrating tube elements when a nearby cannon was fired at retreat. The most serious emergency calls are those reporting either intermittent outages usually traced to a defective transformer, or binding shafts and stripped gears in projector mechanisms.

Engineers of the Service are called upon to install or supervise the installation of all types of theatre equipment under many and varied situations and are, therefore, given basic instructions in many fields. At the same time a certain leeway is allowed to encourage them to develop initiative, individuality, and resourcefulness. Engineers are required at times, for instance, to survey a post for a building most suitable for adaptation for use as a War Department theatre. Such work requires general knowledge of all the factors entering similar work in civilian houses plus the special requirements of the Army. Whereas his main responsibility is that of a sound-projection engineer, he serves also in an advisory capacity for work in connection with building structure and building utilities.

Providing replacement parts for regular and emergency servicing visits is but one of many responsibilities of the E. & M. Division, where provisions are established to meet promptly any request as regards sound and projection equipment. Instructing engineers is another. Representative equipment is set up at the E. & M. Division for operation in a test projection room equipped with regard to all fire precautions.

In this projection room all types of amplifiers, supply units, warping circuits, cross-over networks, auxiliary testing apparatus including oscillator, oscillograph, flutter meter, and a patch panel of plugs, receptacles, and switches arranged to operate any or all of this equipment, are mounted on a special rack (Figure 2). All equipment reconditioned in the E. & M. Division is rolled into the projection room on dollies, plugged in to this rack and operated.

Maintenance of Equipment

All sound and projection equipment used in War Department theatres is reconditioned, when required, at the E. & M. Division. All new types of sound and projection equipment are examined and tested here before purchase. Engineers' recommendations are considered and tested. Installation material and kits for all theatres are made up here.

The E. & M. Division machine shop fabricates not only replacement and modified units of equipment but items such as fire shutters, portable switch panels, projector fuse blocks, loud speaker terminal strips, and many other items which assist in facilitating the installation and servicing work in the field. The engineer's kit of tools and instruments is organized here. It is here that the modifications cited previously were developed and tested. It is here that decisions are made as to the standards of sound and projection equipments to be used.

The present emergency conservation of vital materials has brought about elimination of many refinements not only in equipment but in methods of installation and operation. For example, d-c arc switch panels and rubber cables have been eliminated. A "victory" projection-room wiring plan eliminates all conduit and junction boxes. Braid-x types of cables and loom have been substituted therefor. Carbons are burned at a minimum value of current. Copper drippings and copper coating from carbon stubs are being saved.

In other words, the Engineering and Maintenance Division is discharging its responsibility of supplying the patrons of War Department theatres with the finest possible visual and sound reproduction.

Gases from Carbon Arcs

By G. I. SHERMAN, Ph. G.

MEMBER OF L. U. NO. 306

WHEN combustion takes place in a motion picture lamphouse, several gases are produced. The more important are carbon dioxide, carbon monoxide, and nitrogen oxides. The last two gases are considered very toxic.

Motion picture projectionists have raised the question, from time to time, of the effect of these gases on themselves. The laboratories of the National Carbon Company, the College of Medicine of the University of Nebraska, the School of Public Health of Harvard University and the Department of Health of the City of Detroit have run a series of experiments to determine the effects that may be produced upon the projectionist by these gases.

The results of these experiments show that no alarming health hazards are present. The principal poisonous agent to which projectionists are exposed is nitrous oxide. Careful measurement of the exposure indicates it to be below the concentration usually considered harmful, provided that projection rooms have an adequate fresh air inlet and a positive pressure exhaust fan at the top of the fire stack.

The necessity and desirability of adequate ventilation should rest on grounds entirely separate and apart from the gas and fume consideration. The proper approach to the solution of projection room ventilation should be from the general standpoint of providing comfortable working conditions for the projectionist.

If this be done the arc gases cannot possibly approach an objectionable concentration in the projection room, even though the draft through the lamp house should not be adequate for their complete elimination. Good ventilation in the projection room will arrest the fears and worry of the projectionist as to whether or not the fumes are harmful.

Underwriters Code As It Affects Projection Rooms

Every projectionist knows that his equipment and operations, and any changes he may make in his equipment, must meet the Fire Underwriters' requirements. How many projectionists know what those requirements are in detail? IP will reprint from time to time portions of the National Electrical Code that are important to the projection room, and amendments to the Code as they are issued. Herewith is presented the sixth installment, with some of the definitions and wiring rules that will be needed for understanding subsequent installments. IP welcomes inquiries on practical application of the Code to projection room problems.

VI.

Ratings and Settings

2421. *Fuses.* Fuses shall have ratings not greater than the allowable carrying capacity of the conductor as required by section 2403. Plug fuses and fuseholders shall not be used in circuits exceeding 125 volts between conductors, except circuits of a system having a grounded neutral and no conductor at more than 150 volts to ground.

Enclosures

2436. *General.* Overcurrent devices shall be enclosed in cutout boxes or cabinets, unless a part of a specially approved assembly which affords equivalent protection, or unless mounted on switchboards, panelboards or controllers located in rooms or enclosures free from easily ignitible material and dampness. The operating handle of a circuit-breaker may be accessible without opening a door or cover.

Article 250—Grounding

2501. *Scope.* This article treats of protection of electric installations by grounding. Insulation, isolation, and guarding are suitable alternatives under certain conditions.

2543. *Fixed Equipment — Specific.* Exposed, non-current-carrying metal parts of the following kinds of equipment, regardless of voltage, shall be grounded:

a. Frames of motors as specified in section 4436;

b. Controller cases for motors, except lined covers of snap switches;

d. Electric equipment in garages, theatres and motion picture studios, except pendent lamps on circuits of not more than 150 *volts to ground;*

e. Motion-picture projection equipment;

f. Electric signs and associated equipment, unless these are inaccessible to unauthorized persons and are also insulated from ground and from other conductive objects;

g. Generator and motor frames in an electrically operated organ, unless the generator is effectively insulated from ground and from the motor driving it;

h. Switchboard frames, except frames of direct-current, single-polarity switchboards, which are effectively insulated.

Methods of Grounding

2551. *Effective Grounding.* The path to ground from circuits, equipment, or conductor enclosures shall be permanent and continuous and shall have ample carrying capacity to conduct safely any currents liable to be imposed on it, and shall have impedance sufficiently low to limit the potential above ground, and to facilitate the operation of the overcurrent devices in the circuit.

2552. *Grounding Conductor to Circuit.* The grounding conductor may be connected to the grounded circuit conductor at any convenient point on the premises on the supply side of the service disconnecting means.

2553. *Common Grounding Conductor.* The grounding conductor for circuits may also be used for grounding equipment, conduit and other metal raceways or enclosures for conductors, including service conduit or cable sheath and service equipment.

2555. *Short Sections of Raceway.* Isolated sections of metal raceway or cable armor, if required to be grounded, shall preferably be grounded by connecting to other grounded raceway or armor, but may be grounded in accordance with section 2556.

2556. *Fixed Equipment.* Metal boxes, cabinets and fittings, or non-current-carrying metal parts of other fixed equipment, if metallically connected to grounded cable armor or metal raceway, are considered to be grounded by such connection. If not so connected they may be grounded in one of the following ways:

a. By a grounding conductor run with circuit conductors in wire assemblies; this conductor may be uninsulated, but if an individual covering is provided for this conductor, it shall be finished to show a green color;

b. By a separate grounding conductor installed the same as a grounding conductor for conduit and the like;

c. By special permission, other means for grounding fixed equipment may be used.

2557. *Equipment on Structural Metal.* Electric equipment secured to and in contact with the grounded structural metal frame of a building, shall be deemed to be grounded. Metal car frames supported by metal hoisting cables attached to or running over sheaves or drums of elevator machines shall be deemed to be grounded if the machine is grounded in accordance with this code.

2558. *Portable Equipment.* Non-current-carrying metal parts of portable equipment may be grounded in any one of the following ways:

a. By means of the metal enclosure of the conductors feeding such equipment, provided an approved multi-prong plug or equivalent is used, one prong for the purpose of grounding the metal enclosure, and provided, further, that the metal enclosure is attached to the plug and to the equipment by connectors approved for the purpose;

b. By means of a grounding conductor run with the circuit conductors in wire assemblies, provided an approved multi-prong plug or equivalent is used, one prong for the purpose of connecting such grounding conductor to the grounded metal raceway or cable armor; this conductor may be uninsulated but if an individual covering is provided for this conductor, it shall be finished to show

a green color;

c. By means of a separate flexible wire or strap, insulated or bare, protected as well as practicable against mechanical injury.

2559. *Grounding Equipment to Circuit Conductor.* The grounded circuit conductor on the load side of the connection to ground shall not be used for grounding equipment, cable armor, or metal raceways, except by special permission as provided in sub-paragraph c of section 2556.

Bonding

2571. *Bonding at Service Equipment.* Where the supply is from an overhead distribution system the electrical continuity of the following equipment and enclosures shall be assured by one of the means given in paragraph 2572:

a. The service raceways or service cable armor or sheath;

b. All service equipment enclosures containing service entrance conductors, including meter fittings, boxes or the like, interposed in the service raceway or armor;

c. Any conduit or armor which forms part of the grounding conductor to the service raceway.

2572. *Means of Assuring Continuity.* Electrical continuity at service equipment shall be assured by one of the following means:

a. Threaded fittings with joints made up tight, where rigid conduit is involved;

b. Threadless fittings, made up tight, for electrical metallic tubing;

c. Bonding jumpers meeting the other requirements of this article. Bonding jumpers shall be used around concentric or eccentric knockouts which are punched or otherwise formed so as to impair the electrical connection to ground.

d. Other devices (not locknuts and bushings) approved for the purpose.

2573. *Metal Armor or Tape of Service Cable.* With service cable having an uninsulated grounded service conductor in continuous electrical contact with its metallic armor or tape, the metal covering is considered to be adequately grounded.

2574. *Voltages Exceeding* 150 *Volts.* The electrical continuity of metal raceway or metal sheathed cable which contains any conductor of more than 150 volts to ground shall be assured by one of the methods specified in section 2572, or by one of the following methods:

a. Threadless fittings, made up tight, with conduit or armored cable;

b. Two locknuts, one inside and one outside of boxes and cabinets.

2575. *Loosely-Jointed Metal Raceways.* Expansion joints and telescoping sections of raceways shall be made electrically continuous by bonding jumpers or other approved means. Metal trough raceways used in connection with sound recording and reproducing, made up in sections, shall contain a grounding conductor to which each section shall be bonded.

2576. *Hazardous Locations.* In hazardous locations, regardless of the voltage involved, the electrical continuity of metallic raceway, boxes and the like, shall be assured by one of the methods specified in sub-paragraphs a, c, and d of section 2572.

2577. *Bonding Jumpers.* Bonding jumpers shall conform to the following:

a. Material and Size. Bonding jumpers shall be of copper or other corrosion-resistant material and shall be of sufficient size to have current-carrying capacity not less than is required for the corresponding grounding conductor;

b. Attachment. Bonding jumpers shall be attached to cabinets and the like in a manner provided in section 2613; where used between grounding electrodes or around water meters, gas meters, and the like, they shall be attached in a manner provided for in section 2614.

Grounding Electrodes

2581. *Water Pipe.* A continuous metallic underground water piping system shall always be used as the grounding electrode where such piping system is available.

2582. *Other Electrodes.* Where such a water piping system is not available, the grounding connection shall be made in a manner to secure the most effective ground. Any one or combination of the following may be used:

a. The metal frame of the building, if effectively grounded;

b. A continuous metallic underground gas piping system;

c. A local metallic underground piping system, metal well casing, and the like;

d. An artificial ground whose electrode consists of a driven pipe, driven rod, buried plate, or other device approved for the purpose.

2583. *Artificial Electrodes.* Artificial ground electrodes, consisting of plates, pipes or rods, shall conform to the following:

a. Plate Electrodes. Each plate electrode shall present not less than 2 square feet of surface to exterior soil. Electrodes of iron or steel plates shall be at least ¼ inch in thickness. Electrodes of non-ferrous metal shall be at least 0.06 inch in thickness.

b. Pipe Electrodes. Electrodes of pipe or conduit shall be not less than ¾ inch internal diameter, and if of iron or steel shall be galvanized.

c. Rod Electrodes. Electrodes of rods of steel or iron shall be at least ¾ inch in diameter. Approved rods of non-ferrous materials or their approved equivalent used for electrodes shall be not less than ½ inch in diameter.

d. Installation. Artificial electrodes shall, as far as practicable, be imbedded below permanent moisture level. Except where rock bottom is encountered, pipes or rods shall be driven to a depth of at least 8 feet regardless of size or number of electrodes used. Pipes or rods when less than standard commercial length shall preferably be of one piece. Such pipes or rods shall have clean metal surfaces and shall not be covered with paint, enamel or other poorly conducting materials. Where rock bottom is encountered at a depth of less than 4 feet, electrodes shall be buried in a horizontal trench, and if pipes or rods are used as the electrode they shall comply with sub-paragraphs b and c of this section and shall not be less than 8 feet in length. Each electrode shall be separated at least 6 feet from any other electrode, including those used for signal circuits, radio, lightning rods, or any other purpose.

(To be continued)

Suggestions Aiding the Conservation of Copper

AT THE recent meeting of the S. M. P. E. Atlantic Coast Section, E. R. Geib, of National Carbon Company, paid tribute to the splendid cooperation received from the industry in the collecting and turning in of copper drippings and peelings from projector carbons.

"It has come to our attention," Mr. Geib stated, "that in some instances stubs of the used projector carbons are being included with the valuable metal. This practice makes it difficult to dispose of the scrap to the best advantage. I would like to point out that labor is not available at any point except in the theatre for the removal of the copper plating from these stubs. This copper should, therefore, be peeled off and included with the drippings, and the stubs discarded.

"Reports have come to us that some people are under the impression that because the copper drippings have an oxidized appearance they are valueless. This is not correct. If the drippings and peelings are not contaminated they yield at least 90% copper, so we urge each of you who has anything to do with copper coated carbons to save the drippings and peelings and turn them over to the supply houses who, in turn, will see that they go to the salvage concerns."

WHEEL DISTORTION IN MOVIES CURED

Elimination of that type of distortion in motion pictures which at times makes the wheels of vehicles appear to be revolving backward has been achieved by the Emerson Yorke studios of New York City.

The invention developed out of Emerson Yorke Studio's work in making instructional films depicting war plant machine operations. In such films a drill, for example, would sometimes appear to be revolving backward, just as vehicle wheels occasionally do in ordinary pictures. In order to make the instructional films fully effective it became necessary to cure this form of distortion, and a mathematical study of its cause was undertaken.

It was found that this stroboscopic distortion is inevitable when the speed of motion of the object being photographed bears a certain numerical relation to the camera speed. Either the camera mechanism or the object photographed must be made to move at a different speed.

In making instructional films, Yorke often changes the rate of motion of the film in the camera (not in the projector; it is still projected at the standard 90 feet per minute). Accompanying sound is recorded on a separate film at 90 feet per minute. If the sound is a mere buzzing or whirring noise, such as is often created by machinery, exact synchronism is of course unimportant. In such cases, when the camera has been speeded up, the sound is recorded for a few seconds longer, so that sound negative and picture negative will be of the same length, and can be brought together into a master negative from which prints are made. If the camera has been slowed down a little less of the sound is recorded, keeping sound negative and picture negative the same length.

Where sound must be recorded in detailed synchronism with the action, it is of course impossible to change the speed of the camera without also changing the speed of the recording mechanism. And if the speed of the recording mechanism is altered the sound will be off key when the ultimate print is projected at 90 feet per minute. In such instances Yorke changes the speed of the moving object.

In the case of a vehicle wheel, airplane propellor, etc., which shows the stroboscopic effect when photographed, the vehicle or propeller is driven either faster or slower. If this is undesirable, if the object must move at a pre-determined speed, the size of the wheel or propeller is changed so that it revolves either faster or slower at the same rate of vehicle speed. But if sound is not being recorded in detailed synchronism at the moment, the object speed may be left as it was, and the speed of the camera changed instead.

January Contest Winners

First Prize

GILBERT CLEMENT
12A Harvard St.
Nashua, N. H.

Second Prize

MAURICE RUSHWORTH
531 S. Longwood St.
Baltimore, Md.

Third Prize

H. D. TAYLOR
1516 Greenwood St.
Raleigh, N. C.

Winners of One-Year Subscriptions to I.P.

GEORGE J. BELTZ
33 Ninth St.
McMechen, W. Va.

C. L. CROMER
632 C Ave.
W. Columbia, S. C.

STANLEY L. JAMES
6 Caroline St., S.
Hamilton, Can.

EARLE W. KRONEBERGER
4104 Garrison Blvd.
Baltimore, Md.

WILLIAM J. SCHMITZ
61 Oakdale Blvd.
Pleasant Ridge, Mich.

JAMES W. TARR
Cozy Theatre
St. Joseph, Mich.

Honorable Mention

PAUL COTA
Palace Theatre
Mason City, Ia.

H. J. PLEXMAN
409 Murray St.
Sudbury, Can.

RAY RIDGWELL
79 Cumberland Ave.
Portland, Me.

MARTIN TEKER
Sheridan, Mont.

JOSEPH M. WILLIAMS
163 N. Euclid Ave.
Westfield, N. J.

RUSSELL A. SCHREMPP
Lyric Theatre
St. Louis, Mo.

W. E. WAR EFFORT INCREASES

With the production of war materials up more than seven times over 1941, and telephone manufacture for the Bell System virtually ended for the duration, the Western Electric Company looks ahead to "vastly greater" effort during the coming year, according to a statement addressed to employees by C. G. Stoll, president of the Company.

I. P. CONTEST

(*Continued from page* 15)

three-way wide range WE type, later converted to the two-way. We quote: .

"Every morning we test the two groups of speakers separately. There is a three-deck, four-point switch, and in one position the signal is sent to the woofers and in another the signal is sent to both groups. When the switch is on 'L.F.,' the third position, everything in the network is cut out except the connections from the input to the low frequency line. A connection including a 4 millihenry choke (to hold back everything above 300 cycles), and part of a Ward Leonard heavy-duty resistor—in our case 1.75 ohms of this resistor is being used. Merely shorting out this 4 millihenry choke sends all frequencies to the woofers and this doesn't sound so bad. As a matter of fact from the top balcony the sound seems normal, but downstairs I cannot hear a lot of highs that I am used to. However, I doubt if anyone but a musically inclined patron would notice anything amiss. . . . The Jensen woofers will go up to 4,500 or 5,000 cycles, which is as much as you can get from a phonograph record." *(Commercial lateral cut.—Ed.)*

Mr. Rushworth's sketch shows a choke and condenser in series across the input to the high frequency leg. This gives us a tuned circuit which at some frequency, determined by the constants, presents a minimum impedance. Above or below this frequency the impedance increases; at the lower frequencies the condenser impedance predominates, while at the higher frequencies the choke impedance controls. If the condenser opens, the unit and its series and shunt resistors are across the network input. Thus, the frequencies passing through the unit and the magnitude thereof are determined by the impedance of the low frequency leg relative to the high leg at that frequency. Frequencies below 200 cycles, if of any considerable magnitude, are dangerous to apply to 555W Receivers of the type Mr. Rushworth is using. Where these units are used as full range speakers it is customary to provide for a cutoff at 250 cycles on the low end.

H. D. Taylor, the third prize winner, is using the Simplex LU-1002 Network, which includes a switch that cuts out the network and connects the speech line directly across the low frequency speaker, in case of failure of the high frequency leg or the unit. Mr. Taylor proposes some interesting substitutions for defective units, which are quoted in part:

"If a satisfactory condenser combination is not available, C_1(23.5 mf) could be replaced by C_2(23.5 mf) of the low frequency leg, leaving the L. F. speaker connected in series with L_2-(6.76 mf). With this connection the

low frequency cutoff would not be sharp at 400 cycles, but the H. F. speaker would not be overloaded with the low frequencies. The impedance of the speakers and network would be slightly higher than the system output impedance, resulting in a negligible loss of power, but the sound would be good enough to justify using this connection rather than buying condensers for a short emergency. L_1(6.76 mh) would be difficult to replace and in case of failure it could be cut out, leaving the H. F. speaker shunted by R_1(17 ohms) connected in series with C_1. As in the above case the network impedance would be slightly higher and the cutoff frequency would not be as sharp, but the sound would be satisfactory."

George J. Beltz is using the same network as Mr. Taylor and has analyzed the problem in a similar manner although not in quite as much detail. C. L. Cromer has a Motiograph system which includes the same sort of feature as Simplex. He says:

"In a circuit that does not incorporate this feature a jumper can be connected between the network input and the low frequency output, then the filter is eliminated. . . . This change can be made very quickly to keep the show going, but if operation in this manner is to continue for long something must be done to prevent predomination of the lows. The upper range of large bass speakers is limited at best. However, the sound can be improved by removing temporarily any bass boost or high-end loss components from the amplifier proper or pick-up devices."

James W. Tarr seems to be very ingenious in repairing equipment in his theatre. Here is his system for a unit that is not operating properly:

"I have yet to find a wholly unrepairable unit except in cases where the cone or diaphragm had been torn. Shorted or open voice coils can be repaired with a little care, as can the field coils in electro-dynamic units. I found one case where the driver unit was placed so that its throat was facing up and the sounds it was producing were very tinny and not at all natural. The difficulty was that the unit was so full of dirt and grit that it had packed down in the air gap. Thus the diaphragm was unable to move as it should and the sound was very poor. This unit, before it could give satisfactory results, had to be disassembled, the air gap thoroughly cleaned and the voice coil repaired. This voice coil work consisted of varnishing the bare spots on the wire, resoldering the voice coil leads and accurately centering, when the cone and coil were replaced. To eliminate the possibility of this packing occurring again I installed felt dust guards on the unit similar to those found on late model speakers. This job has been in constant use for over four years and has given no trouble since the repairs were made."

Joseph M. Williams would even go back to the sound head in checking the trouble. His thought is:

"Before tearing down the network I would first make sure that the loss of high frequencies was not due to improper focus of the exciting lamp or a yellow and weak exciting lamp. Next I would check the field and voice coils of the high frequency speaker. If and when the trouble was located in the network itself, it would depend upon what component was found defective."

It is true that the conditions described by Mr. Williams with respect to the exciting lamp will cause a loss of high frequencies and a serious loss, too, if the condition is bad. Frequent inspection of this unit of the equipment largely will eliminate it as a source of the difficulty.

This month's question will close this contest. Then we will come to the awarding of the grand prize. This will take some very careful and painstaking study and the issue in which the award will be printed will be announced later.

THE MOTION PICTURE SERVICE

There are now 700 theatres in the Army Motion Picture Service. It is planned to add three hundred more to provide a total of 750,000 seats—with 6,750 programs exhibited weekly.

IN THE SPOTLIGHT

(*Continued from page* 13)

our contention that Mr. Harry Brandt is not kindly disposed towards organized labor, to put it mildly.

The Windsor Theatre, in New York City, had been operated by the Brandt Circuit on the last and best three days of the week, namely, Fridays, Saturdays, and Sundays. The booth costs for these three days was agreed upon by Local 306 and the Brandt Circuit as $181.92, or $60.64 for each man. There was an understanding between Local 306 and the circuit that if a holiday fell on either a Thursday or a Monday and the management decided to open the theatre for business, that the same wage scale would prevail. Everything ran along fine until last Washington's birthday, which fell on a Monday. When the projectionists reported for work that day, the manager of the theatre came up to the projection room and ARBITRARILY advised them that the day's pay would be reduced from $60.64 to $42, or a cut of $6.21 for each man. The men refused to accept this unwarranted cut and together with the stage hands, members of the sister local, Stage Hands Local No. 1, they refused to service the theatre and walked out. Of course, the Brandt Circuit feels itself very much the injured party and is suing Morris Kravitz, Local 306 business agent, for $10.000. We wonder if the Brandt outfit merely used the cut in the projectionists' salaries, which they must have known would never be sanctioned by Local 306, as an excuse to close the theatre and in that way get out of an unprofitable vaudeville contract? We do not know—we are merely thinking out loud.

● Congratulations to Harry Storin on his recent 25th wedding anniversary. His two sons, Lt. Jay Storin of the Signal Corps, and Lt. Fred Storin of the Anti Aircraft Division, were home on furlough for the occasion.

● Our attention was recently called to a letter written by an I. A. member to the War Manpower Commission stating that many motion picture projectionists who work shift jobs in theatres, could help in the war effort by devoting the rest of their time to the war industry. The following reply needs no further comment:

Dear Mr. —

Mr. McNutt has asked me to thank you for your letter of January 19 concerning the utilization of part-time workers in the war effort. The spirit of patriotism which prompted your letter is deeply appreciated and I am glad to have an expression of your views on the subject. As you know, one of the purposes of the War Manpower Commission is to set up procedures for using the Nation's total manpower and to make certain that it will be available when and where it is needed.

The utilization of part-time workers in war industry has been investigated by the War Manpower Commission. The need for such workers varies in different areas and at different times. Any plan that would be adopted would have to be suited to the needs of a particular locality.

Many practical problems need to be solved before a program of part-time work can be adopted on any significant scale. The situation is being intently studied by the War Manpower Commission at the present time, and you may be assured that your suggestion will receive appropriate consideration.

HAROLD DOTTERER, *CHIEF*
Administrative Service
War Manpower Commission

DE VRY AWARDED ARMY-NAVY "E"

The Army-Navy "E" for Excellence in production of motion picture cameras, sound projectors and special training devices for the Armed Forces has been awarded to the DeVry Corporation, pioneer Chicago manufacturers.

BUY WAR BONDS

POWER UNIT

(*Continued from page 8*)

compared with the load current. The reason is apparent from the discussion of the characteristics of the ballast lamp. This means, however, that the no-load voltage of the unit is comparatively high. In fact, if the load is disconnected and the power unit allowed to run, R_3 will burn out.

Actually the load is always connected in service, but this is a point to bear in mind when any tests are being made. Capacitor C_2, connected electrically across the output, completes the two stage choke input filter. By placing it at this point instead of just to the left of L_1 filtering is improved in that as the current passes through the lamp and R_2 the voltage is decreased, the ripple voltage likewise, and the capacitor smooths out what remains so that at the output terminals only a 1% ripple is passed along to the exciter lamp. In this way the most efficient use is made of the components to obtain a well filtered unit.

In the design of a unit of this type the regulation or ratio of no-load to full load output voltage is one of the considerations. This is balanced against the type of service for which the unit is designed. If a comparatively high no-load voltage cannot be tolerated, a heavier load must be applied across the output terminals to obtain a more constant current through the unit, with or without load.

The voltage dividers employed in amplifier circuits is one way of accomplishing this result. Calculations of one of these circuits will show that the voltage output of the rectifier tubes does not go out of bounds under the no-load condition. In an amplifier the currents involved are in milliamperes, and the components that carry these currents do not become unreasonably large.

In an exciter lamp power unit, on the other hand, the currents handled are in amperes, the power to be dissipated is in the higher wattages and consequently the components must be considerably larger. The rectifier tubes must also be larger in capacity and much larger physically. All of these contribute to a bulky and expensive unit and also one that dissipates a great deal of heat, which complicates the ventilation and installation problem. Such a unit is more expensive to operate and maintain and would not be popular with those who pay the bills.

It can be seen readily that when the load is constant, practical design dictates that the load regulation requirement may be relaxed. The components then may be selected to constitute a compact unit, accessible for servicing and one that insures proper functioning under the actual circuit conditions. Such a unit will be economical to construct, operate, install and maintain.

MIDWEST THEATRES STRESS FIRE PREVENTION

Theatre owners in Des Moines have distributed and posted fire safety rules in their houses following recent warnings that theatres damaged by fire might be forced to close down for the duration because of scarcity of materials. The fire safety rules are as follows:

(1) Pull the main switch after shows.

(2) No smoking in projection rooms.

(3) Do not accumulate rubbish.

(4) Store films in fireproof film cabinets. Never leave them in projectors or rewind.

(5) Never use electric or other open heaters near film.

(6) Keep booth porthole shutters in good working order, fused and tested frequently.

(7) Keep electric wiring in good condition; repair or replace faulty electric contacts and switches; check carefully entire electric system, the cause of most theatre fires.

(8) Have local fire officials inspect the theatre frequently and follow their recommendations.

ALTEC TO SERVICE 66 GRIFFITH-WESTEX THEATRES

R. E. Griffith Theatres, Inc., has entered into an agreement with Altec Service Corporation to service 66 Griffith and Westex houses in Texas. C. J. Zern negotiated for Altec.

BELL & HOWELL ANNOUNCES NEW "V" FILMOSOUND

The new Filmosound "V" Projector, at present available only to the armed forces, contains every feature essential to excellent film projection and film protection, it was announced recently by Bell & Howell.

Presaging better "things to come", the Filmosound "V" Projector includes such features as a new sound head of welded sheet steel which substitutes the casting employed formerly, a carrying case of waterproofed fir, zinc die castings in place of aluminum, and a larger carrying handle with an automatic spring to prevent it from resting over the lamphouse vent when the machine is in operation.

Geer case ventilation has been improved with the result that oil vapor is now exhausted through the cooling system to prevent the formation of oil film on optical components of the projector.

Other improvements include a loud speaker of more efficient construction and special treatment of all condensers and resistors to reduce the effect of humidity. Amplifier temperatures are lower in this model as a result of improved sound head ventilation.

LOEW'S TOPS BOND DRIVE

In line with the Treasury's "Top That 10 Per Cent" War Bond drive, Loew's, Inc., reports that its over-all payroll savings plan, including the studios, has reached 11½ per cent of pay roll.

The foreign, sales, accounting and construction departments are between 96 and 100 per cent enrolled. Owing to the rapid turnover of ushers and other theatre employees, however, it is virtually impossible to reach 100 per cent War Bond enrollment in that division.

TO PROJECTIONISTS!

Visitron cells are available for every type of sound projection equipment. Theatre supply dealers can advise the correct cell for your equipment. Buy from your supply dealer. If you wish to have your old cells tested without charge, write to G-M Laboratories, Inc., for instructions for shipping. Information furnished promptly.

INTERNATIONAL PROJECTIONIST

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Get the most from your VICTORY CARBONS

RECOMMENDED TRIM AND RANGE OF ARC CURRENT FOR LAMPS USING COPPER COATED, HIGH INTENSITY, PROJECTOR CARBONS

Type of Arc	*Arc Current — Amperes*	*New Victory Carbons — Size and Type*
"1 Kw" High Intensity, A.C.	52-66	7 mm x 9 inch H.I., A.C. Carbons in both holders
"1 Kw" High Intensity, D.C.	40-42	7 mm x 12 inch or 14 inch "Suprex" Positive 6 mm x 9 inch "Orotip" C Negative
Simplified High Intensity, D.C. with *adjustable* feed ratio	42-45	7 mm x 12 inch or 14 inch "Suprex" Positive 6 mm x 9 inch "Orotip" C Negative
Simplified High Intensity, D.C. with *fixed* feed ratio	42-45	7 mm x 12 inch or 14 inch "Suprex" Positive 7 mm x 9 inch "Orotip" C Negative
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USE CARBON TRIM RECOMMENDED FOR YOUR PROJECTION EQUIPMENT.

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Monthly Chat

NOT any too much has been written touching upon the necessity of keeping all equipment in tip-top condition in view of the difficulties in obtaining new items or even replacement parts. In addition to the breakdown hazard there also is the danger of fire, of bent reels, worn sprockets and any other irregularities in the film path increases the danger of film breakage, pile-up—and fire. The urgent necessity for constant exceptional care in making film splices and in examining film is more pronounced than ever before.

The strictest attention also should be given to the projector when it is in operation and the running film should be watched more carefully than during normal times. We cannot afford to take any chances that might result in a fire. The wise and practical projectionist does not fail to observe every possible precaution.

• • •

I. P. recently chronicled the formation of the Scophony Company of America under an agreement with the British Scophony Company, an organization which for years has been showing full size television pictures with marked success in England. These programs are well received in Great Britain. It seems probable that similar programs are planned for this country after the war, and the thought comes to mind that projectionists who already have experimented in television should continue to carry on in order that they will be abreast of developments as they come forth.

When, as and if television programs are introduced into our own theatres the duties of the projectionists will become additionally complex, which, in turn, will make them even more indispensable than now is the case. To those who have not kept up with these television developments we suggest that you make it your urgent business to find out at first hand what is going on in this field. Television on a commercial basis has been "just around the corner" for several years now and it is not unreasonable to anticipate that after we have achieved victory real progress in public showings will be made. Television may be upon us before we know it!

• • •

Everyone who possibly can do so should heed the plea of James M. Landis, Director of Civilian Defense, who urges every man, woman and child who can work with a spade, rake and hoe to plant Victory Gardens, for they will prove a practical defense against food shortages. Victory Gardens offer the city chaps who for years have been longing to till their own piece of land a 100 per cent opportunity to prove they meant what they said. They also will contribute materially in the home front fight to victory, which is their main purpose.

INTERNATIONAL PROJECTIONIST

VOLUME XVIII APRIL 1943 NUMBER 4

Practical Pointers on 16mm Sound Projection*

By *JOHN W. BOYLE, A.S.C.*

MODERN 16mm. sound projectors have been designed with an eye to simplified operation, and the sound reproducing part of the projector is almost as easily operated and as durable as your phonograph or radio. The details and arrangement of the various makes and models may differ slightly; but once you understand the basic principles of sound-film reproduction you'll find it easy to understand and operate any type of projector.

While the sound and the picture are printed on the same strip of film, they are not placed literally together. The picture must go through its projection aperture with an intermittent movement. The sound must go through its reproducing aperture with a continuous movement. So the sound which synchronizes with any given picture frame is printed on the edge of the film 25 frames ahead of the picture. That is, when the picture frame is in the aperture, its accompanying portion of sound-track is about 7½ inches below the picture aperture. The sound pick-up is located at a position such that when properly threaded through the various sprockets and idlers which give the film the properly smooth motion past the sound-head, there will almost automatically be just 25 frames of film between the picture and sound apertures.

The picture projecting mechanism, as a rule, will turn out to be an old friend. This component of the projector is usually identical with the same manufacturer's silent projectors, and can be threaded and operated in exactly the same way. If, as in one or two recent designs like the Eastman sound projectors, the entire projector is a new design not based on previous silent models, you will still find enough family resemblance so that the picture component is easily understood.

Only when you pass the lower driving sprocket do you find sound rearing its ugly head. From this sprocket the film makes a fairly taut loop around the drum at which the sound pick-up is located. From there, in most designs, it passes over another sprocket and through various guiding rollers and idlers to the take-up.

Right Tension Needed

Probably the most important single factor in good sound reproduction is to have the film move past the sound-scanning aperture at a really smooth rate. For this reason, the sound pick-up is almost always located at a drum. This drum is not driven by the projector mechanism: it is revolved entirely by the friction of the film passing over it. In turn, the drum is attached to a fairly heavy flywheel or some other form of movement-smoothing "damper," so that once started, it tends to keep revolving at a smooth and uniform rate, and to keep the film's motion uniform, as well.

Therefore the tension of the film around the sound drum must be just exactly right. If it's too tight, it is likely not only to tear the sprockets, but to transfer to the film at the pick-up point a flutter or irregularity as the teeth of the driving sprockets catch in engaging and disengaging the film sprocket-holes. If it's too loose, you lose the value of the flywheel action, and the film may bulge forward off the flywheel, and out of the focus of the sound-scanning beam. The result in either case is bad sound quality.

The different manufacturers have devised different methods of getting this tension right. Some projectors use various systems of spring-tensioned idling rollers. Bell & Howell, in their Filmosound projectors, use an ingeniously

*Amer. Cinematographer, March 1943.

simple mechanism they call the oscillatory stabilizer. It consists of two spring-tensioned rollers, one bearing on the film feeding onto the drum, the other on the film feeding off the drum, and both mounted at opposite ends of a single arm which pivots at its center. When the film tightens too much against one roller, this pivoted mount automatically slacks off the tension on the other roller, keeping the movement of the film surprisingly uniform.

In general, when you thread the film over the sound drum remember not to try to pull it too tight; just be sure it's in good contact with the drum, but not binding.

Anyway, most 16mm. sound projectors have pretty full instructions, including a complete threading diagram, either marked on the projector itself or prominently printed inside the projector's carrying-case or blimp. If you find you've got to operate an unfamiliar projector on short notice, a few minutes spent studying this chart should take all the mystery out of its operation.

Hook-up Simplified

Hooking up the wires for the sound part of the projector has also been simplified and made as nearly foolproof as possible. With some projectors, a single lead may serve to feed power to both the picture-projection mechanism and the amplifier; but in most designs there are separate power inputs for projector and amplifier. In some of them a single power cable divides at the end into two female connections, which are plugged into adjacent inputs. As a rule, it doesn't matter which plug goes into which power input, so long as both receive current of the proper voltage and frequency.

In some sound projectors the amplifier is built as a separate unit; in others, it is built right into the base of the projector, or into its blimp. If the amplifier is separate, you will usually need a short cable to connect the amplifier to the sound pick-up. Otherwise, you won't, as the connection will be built-in.

Finally, there must be a cable connecting the amplifier with the loudspeaker which is of course placed "down front" near the screen.

These various outlets and inputs are always clearly labeled. And just in case someone might get careless about making these connections most of the manufacturers have arranged their wiring so that the right plug can *only* be put into the right hole. For example the line from projector to amplifier may have a four- or six-contact plug like the base of a radio tube with one of the round contact prongs slightly larger than the rest so that it will only fit into its correct hole, automatically aligning the other contacts correctly. The line from the amplifier to the speaker may have terminals with a different number of contacts or perhaps, a rectangular plug using four or six rectangular bars—one of which is at right angles to the others—instead of the round prongs. In other words, as long as you don't try to force a plug into an input that won't receive it, you've very little chance of going wrong.

Only remember that both the projector and the amplifier must receive current, and that a line must be established from the projector's sound pick-up to the amplifier, and from there to the loudspeaker, before the outfit will project sound!

Some sound projectors too have amplifiers made so they can handle two sound projectors so that changeovers can be made professionally, without a break. In that event, you'll see the two inputs prominently labeled "Proj. 1," and "Proj. 2," and a switch similarly marked to control the changeover. Many of these amplifiers also have a couple of additional inputs—well labeled—for connecting a microphone or a disc turntable.

On some of the better 16mm. sound projectors there is likely to be an additional control located near the sound pick-up; it may be a little lever, or a sliding knob or button. It is sometimes labeled "Fidelity." Its purpose is to alter the focus of the sound-scanning optical system, so that regardless of whether you have a reduction print from 35mm., which has the emulsion facing the lens, or a dupe from a direct-16mm. original, in which the emulsion is usually away from the lens, the sound pick-up will always be sharply focused, and the sound quality clear.

Controls Are Simple

The sound controls of most 16mm. sound-film outfits are no more complicated than those of your radio. You'll find an "off-and-on" main switch, a volume control, and a tone control. Sometimes there may be two volume controls—one for sound-film volume, and the other for microphone or phonograph volume. These are clearly labeled, too. And sometimes you may find two tone controls, as in a fine radio, one to control the low frequencies, and the other the highs.

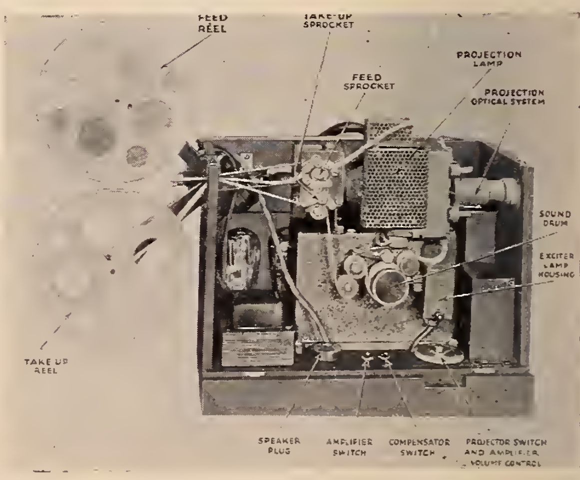
These controls are used just as you would use the corresponding controls on your radio or phonograph at home. In some projectors, you'll find the tone control marked "low" and "high"; in others, the high end will be marked "voice," as that is the setting that gives the best intelligibility, while the low end will be marked "music," as that setting gives the stronger base quality most folks like in recorded music.

It is important to realize that each individual projector, and each film, will have its own best settings for tone and volume. You can play the same reel on two different projectors—even of the same make—and find you'll require different tone and volume settings. Different reels, naturally, will have different recording characteristics, and will require different projector settings to get the best out of them. There is no fixed rule for making these settings: go by what sounds best to you—and don't be afraid to change tone or volume during a reel if you think you can make the sound quality better.

If you can, it is always a good idea to have some sort of a rehearsal before putting on a show, so that you can familiarize yourself with the characteristics of the projector, the sound-quality of the film, and the acoustical quality of the auditorium. In this connection, remember that if you rehearse in an empty auditorium, you will need to step up the volume a bit for the actual performance, for the bodies of your audience will absorb a surprisingly lot of the sound. Speaking generally, try to keep your volume level such that if you stand in the middle of the auditorium and listen, it will be right. If you try to gauge the volume by what you hear back

(*Continued on page* 22)

Layout of a typical 16mm. sound projector. The detail arrangement of the components varies in different designs, but the essential parts indicated in the illustration can be found in all makes.



Two Resistance Coupled Voltage Amplifiers

By *LEROY CHADBOURNE*

THE two voltage or volume control amplifiers shown in schematic form in Figures 1 and 2 are so similar that they should logically be treated together, yet each has its own special features. Both are resistance coupled throughout and are designed to work from and into high impedance lines. One amplifier per Figure 1 is associated with each projector, while the other amplifier is common to two machines. In the first instance the amplifier works from a 500,000 ohm line and in the second case from two 500.000 lines in parallel. On the output. the first amplifier works into a 12,500 ohm line. Note that R_8 is 25,000 ohms and that the outputs of the two amplifiers required for a system are in parallel. The second amplifier works into a 10.000 ohm line. Note that R_{10} is 10,000 ohms.

Now let us trace the plate supply to VT_1 in Figure 1. Voltage from the power amplifier of the system is connected to the plate terminal at the right of the figure. It passes through R_{12}, through R_4 to the plate of VT_1 and also through R_5 to the screen of this tube. The screen and plate currents combine on the cathode and pass through R_2 and R_3 to ground thus completing the circuit back to ground in the power amplifier. It will be noted that R_3 is adjustable and that any change in this resistor varies the bias on the cathode and hence the gain of the amplifier. Actually R_3 has a range of 6 db and functions to balance machine outputs, thus compensating for variations in photocells, vacuum tubes and other components in the circuit. By careful adjustment, machine outputs can be precisely balanced so that there is no volume change on changeover.

The plate supply circuit to VT_1 in Figure 2, it will be noted, is very similar until the current passes through the cathode. Then we find only R_3 between the cathode and ground. The gain adjustment feature is not present. This feature is, however, incorporated in a somewhat different manner. Let us look down and a little to the left in this figure. Here we see P_2 and a resistor and capacitor mesh. This mesh is essentially for filtering purposes to insure a quiet photocell supply as terminals No. 1 and No. 2 are the sources of polarizing potential for the photocells in machines No. 1 and No. 2 respectively. The main plate supply circuit continues beyond the branch to VT_1 and passes through the voltage divider R_4 and R_8 to ground. At the junction of these two resistors a connection is carried to the

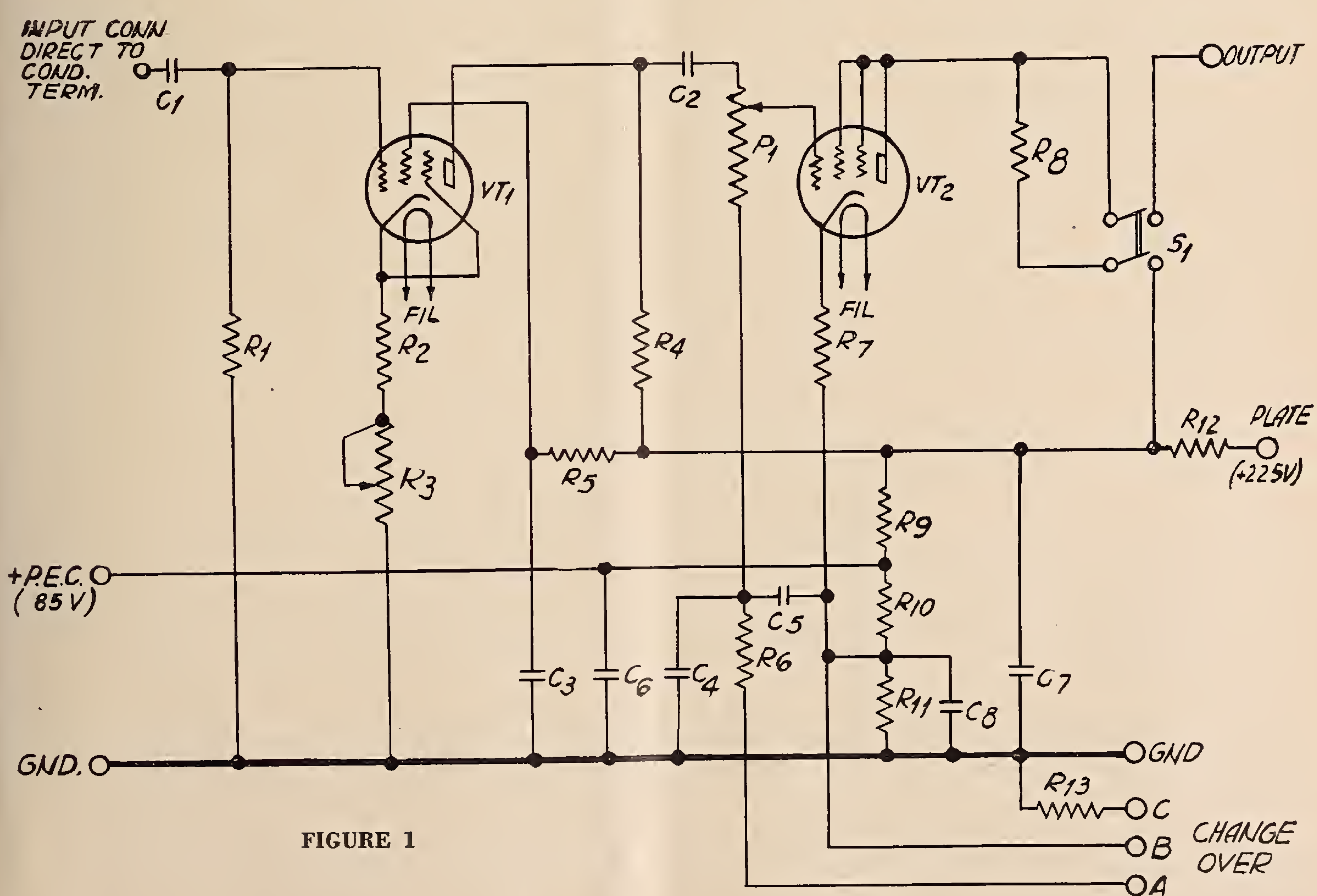


FIGURE 1

slider of P_2. Thus we obtain potential on P_2. Now if the slider moves upward in the figure, the voltage applied to terminal No. 1 increases while that on No. 2 decreases. The output level of machine No. 1 will increase while that of No. 2 will decrease and so the machines may be accurately balanced.

Microphone Jack Provided

Before we leave the first tube circuit let us look at J_1. This jack is provided for the connection of a phonograph or microphone attachment. The contacts are shown with the attachment plug removed from the jack. In this position, the circuit is set up for film reproduction, R_1 being shorted out and sound passes directly from the input terminal to the grid. When the attachment is plugged in the jack springs move upward in the figure and the junction of R_1 and C_1 is grounded, thus the machine outputs are grounded through C_1. The attachment input is across R_2 (500,000 ohms), its value indicating a high impedance pick-up unless a coupling transformer is employed. We thus have a simple method of providing for the use of an attachment.

Still in cathode circuit of the first tube in Figure 1 we find an arrow, which actually is a removable strap, pointing to C_2 and C_3. This provides one step in high frequency equalization and is used in conjunction with the warping circuit provided in the inverse feedback circuit in the power amplifier. Let us see how this eircuit functions. Current flowing from plate to cathode is modulated by the signal or in other words has the signal current superimposed on it. With the strap disconnected, the signal passes through R_3 to the ground bus then through C_4, R_6 and R_9 to the junction with C_5, thus completing its path. Now when the strap is connected to C_2 and C_3 these two capacitors are in parallel with R_3. The impedance of the capacitors decreases as the frequency increases and therefore the impedance of the circuit from the cathode to ground decreases as the frequency increases. Thus the higher the frequency, the more signal modulation in this circuit and the more through R_9. In this way the AC drop across the plate resistor increases and thereby the gain of the stage is increased. C_4 is 0.05 mf compared with 0.01 mf each for C_2 and C_3 so that its impedance is comparatively low.

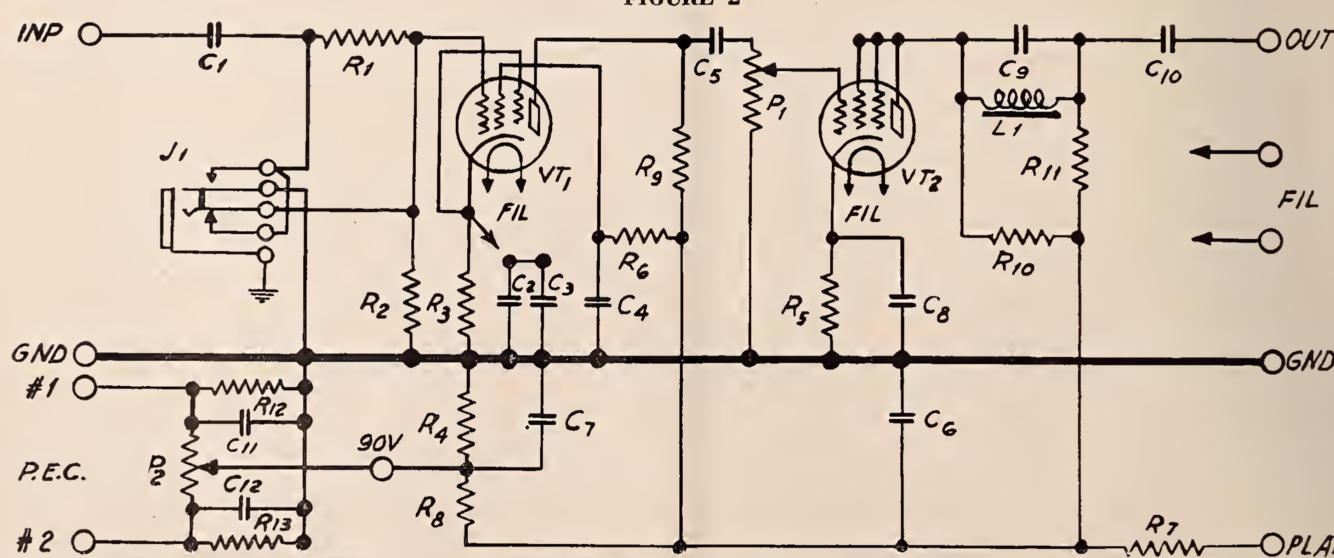
By proper selection of the values of C_2 and C_3 in conjunction with those of the cathode and plate resistors, an infinite number of high frequency curves may be obtained in theory. In practice the number is limited by several design considerations; such as, the gain required in accordance with overall systems requirements, the type of tube best suited for the purpose, limitations in the value of the plate resistor and the practical consideration of the family of high frequency curves usable in the types of theatres encountered. You may wish to apply this same analysis to VT_1 in Figure 1 to determine that a variation in the resistor R_3 will change the gain of the amplifier.

Electronic Sound Changeover

Following the sound circuit from the input at the upper left of Figure 1 through C_1, VT_1 and C_2 we arrive at P_1, which is main system volume control —and remember that there is one for each machine. This volume has a total attenuation of 40 db in twenty steps of 2db each. Now follow the lower end of P_1 down through R_6 to terminal "A" and note the adjacent terminals "B" and "C". These three terminals constitute the sound changeover circuit. Exciter lamp changeover also is employed in conjunction with sound changeover when this amplifier is used. The circuits used are of the three-way type, so arranged that only one amplifier can be used at a time and so that changeover may be made at either machine regardless of which machine is in operation. In the operating amplifier terminals "A" and "B" are connected together while in the other amplifier terminals "A" and "C" are connected. In principle, therefore, changeover is accomplished by operating a single pole double throw switch in which the swinger is connected to terminal "A".

When Terminal "A" is connected to terminal "B" the lower end of R_6 is connected to the junction of R_{10} and R_{11} and the grid is negative with respect to the cathode by the amount of the voltage drop through R_7. When terminal "A" is connected to terminal "C", the grid returns to ground through R_{13} and we find that the grid is negative with respect to the cathode by the drop across the two resistors R_7 and R_{11}. The grid is then said to be biased beyond cutoff and the amplifier is inoperative. Also C_5 is being charged by the voltage at the top of R_{11}. When the "A-B" connection is made, this capacitor is discharged through R_6, which retards the transition from the inoperative to the operative condition and makes the changeover quiet. Under this circuit condition C_4 is now being charged by the voltage from the top of R_{11} through R_6. When the "A-C" connection is made this capacitor is discharged through R_6 and R_{13}. Here again we have the retarding effect conducive to noiseless changeover. C_4 also acts as a filter capacitor. The rate at which these two capacitors discharge is known as the time constant of the circuit and is dependent, considering a given size of capacitor, upon the value of the resistor. The lower the resistor, the more rapid the

FIGURE 2



rate of discharge, until with no resistor we obtain a spark on short circuiting the terminals of the resistor.

If the rate of discharge were too rapid in these particular circuits, changeover disturbances ranging from dull thuds to definite clicks would be audible, depending upon whether the rate was just above the lower limit of audibility or considerably above. So the size of capacitor must be selected, consistent with the requirements of the circuit and the value of the resistors established so that the rate of discharge will be such that there will be no lag in sound on changeover on the one hand and no changeover clicks on the other hand. In this connection we might point out that C_4 is charged through R_6 and therefore the rate at which the operating condition is established also is dependent upon the value of this resistor. All of these factors properly established with respect to each other and with due consideration for the functions of the associated circuits do produce a quiet, rapid changeover of the electronic type.

Tuned Filter Circuit Employed

In Figure 2, P_1 is the main system volume control, having the same range as in Figure 1. We note also that VT_2 is connected as a triode in both amplifiers. The cathode resistor R_5 is by-passed by C_8, which in accordance with our earlier discussion gives some fixed high frequency equalization. Continuing to the right from the plate of VT_2 in Figure 2 we come to a mesh. C_9 and L_1 in parallel, constitute a tuned or resonan circuit, which offers a maximum attenuation at 120 cycles. The system, in which this amplifier is used, employs exciter lamps heated by 60 cycle current. Exciter lamp changeover, with three way switches, is used. This tuned circuit attenuates the slight hum produced by these lamps. It will be remembered th a capacitor presents a high impedance to the passage of low frequency signals and that as the frequency increases the impedance decreases. An inductance (L_1) functions in reverse. Now when these units are connected in parallel, we have an inductance, which tends to suppress any changes in the current through the circuit or, in other words, it has a lagging current. The capacitor, on the other hand, will store energy as the voltage increases and release it as the voltage decreases. This unit is said to have a leading current.

The combination of the units in parallel results in their presenting a maximum impedance at a definite frequency dependent upon the values of the units selected. If two such units were to be connected across the line to accomplish the same result they would be in series. In this instance their characteristics combine so that at a definite frequency their impedance is a minimum, and is equivalent to a resistance. Thus at this frequency the greatest amount of signal will pass through the shunt path and be diverted from the load. Tuned circuits find many applications throughout the field of electronics and speech transmission and this simple mesh may be said to be the basis for the more complex networks used. The high and low pass networks used for selection of frequencies delivered to the high and low frequency speakers in sound systems is one example. The band pass filter is another type widely used, either to pass a definite range of frequencies or to eliminate a definite band of frequencies. Combinations may be used to obtain a variety of results that are astounding.

The resistors R_{10} and R_{11} at either end of this tuned circuit, it will be noted, are connected to the plate supply circuit. R_{10} is actually the plate resistor, while R_{11} has been added to equalize the voltage across the mesh and thereby improve the operation of the circuit. A further difference between Figures 1 and 2 is the inclusion of C_{10} in the output circuit of Figure 2. This is a blocking capacitor for the purpose of keeping plate voltage from the input circuit of the power amplifier. The power amplifier used with Figure 1 has its own blocking capacitor.

The two amplifiers presented in this discussion are examples of modern types of voltage or volume control amplifiers employing high impedance input and output circuits, resistance coupling and in the case of Figure 1 an electronic changeover. But with the development of the electronic art in the past year, who can say what we may expect in the way of sound system amplifiers in the future?

S.M.P.E. Plans Strong Program For 53rd Semi-Annual Meeting

An outstanding program is being planned for the 53rd semi-annual meeting of the Society of Motion Picture Engineers, to be held at the Hotel Pennsylvania, New York, N. Y., May 4 to 6 inclusive. The Papers Committee is assembling an attractive and interesting schedule. Members and others contemplating the preparation of papers to be read at this meeting are urged to communicate immediately with the Chairman of the Papers Committee, at the office of the Society in the Hotel Pennsylvania.

Reception and local arrangements are in the hands of a 22-man committee headed by chairman Dr. A. N. Goldsmith. Oscar Neu and his committee are in charge of hotel and transportation arrangements; the publicity committee is headed by Julius Haber, and the luncheon and banquet arrangements are in charge of D. E. Hyndman and a committee of nine. The projection committee is in charge of H. F. Heidegger and includes the officers and members of New York Projectionists Local No. 306.

The usual get-together luncheon for members, their families, and guests will be held in the Roof Garden of the hotel on May 4 at 12:30 p.m.; addresses by eminent speakers will be one of the highlights of this luncheon. The banquet and dance will take place in the Georgian Room of the hotel on May 5 at 8 p.m.

The tentative program is as follows:

Tuesday, May 4

9:00 a.m.	*Hotel Roof*; Registration
10:00 a.m.	*Salle Moderne*; Business and technical session
12:30 p.m.	*Roof Garden*; Get-together luncheon
2:00 p.m.	*Salle Moderne*; Technical session

Wednesday, May 5

9:30 a.m.	*Hotel Roof*; Registration
10:00 a.m.	*Salle Moderne*; Technical session
12:30 p.m.	Luncheon period
2:00 p.m.	*Salle Moderne*; Technical session
8:00 p.m.	*Georgian Room*; 53rd Semi-Annual banquet and dance

Thursday, May 6

9:30 a.m.	*Hotel Roof*; Registration
10:00 a.m.	*Salle Moderne*; Technical session
12:30 p.m.	Luncheon period
2:00 p.m.	*Salle Moderne*; Technical session

NEW PICTURES REACH ARMY HOSPITALS VIA RED CROSS

Patients in U. S. Army hospitals are now viewing first-run pictures right from their bedsides as a result of a new program in the war efforts of the American Red Cross. This hospital motion picture service is carrying 16 mm. movies to bed patient audiences in military hospitals all over the country, with the Red Cross now operating the third largest motion picture chain in the United States.

The new program is operating under supervision of the four area directors of the American Red Cross, with the group's recreation staff of each hospital arranging for the showings in cooperation with medical officers and hospital staffs. Before the end of the year the ward circuits will cover more than 350 hospitals. Generally, projectionists will be enlisted men, trained in all phases of motion picture operation and detailed to this Red Cross service.

Projectionists Urged to Remain on Their Jobs

EFFORTS being made to have projectionists classified as in an essential occupation by the War Manpower Commission met with a partial setback at a recent Washington hearing when that agency showed it still feels classification of them is a matter for local selective service boards to decide. The committee's views were given when Louis Krouse secretary-treasurer, and Frank Murdock, attorney for the I. A. T. S. E., appeared before the Advisory Committee of the WMC in Washington to plead for an essential classification. The committee let it be known that it will not recommend an essential listing for projectionists so long as motion picture exhibition is not regarded as being essential. The delegation received assurance, however, that projectionists over 38 years of age will not be drafted.

The I. A. T. S. E. officials feel that their recommendations received sufficient consideration by the committee to warrant various locals to go before their boards and ask for individual deferment if induction of a projectionist would mean the closing of a theatre. At an Advisory Committee hearing the morale value of the work done by theatres was highlighted, including their direct support of the war effort and the difficulties in replacing projectionists.

Projectionists Non-Deferable

Some weeks ago Krouse received a letter from the WMC in which it was stated that projectionists were not to be considered as automatically 1-A because their work was not on the non-deferable list. Projectionists were urged, in the letter, to hold on to their jobs.

Collis Stocking, associate director of the Bureau of Program Planning and Review, in a telegram to Abraham F. Myers, Allied general counsel, cited that projectionists should not change their jobs until specific need for change has been indicated. Stocking pointed out that while the WMC Committee on Essential Activities had not included projectionists as in essential jobs, nevertheless it had excluded them from the list of non-deferable occupations.

Much confusion has existed—and still exists—regarding the status of projectionists, with resulting anxiety in the trade, but Myers regards their status as being in the "twilight zone."

Efforts also are being made by the I. T. O. of Ohio to have the WMC reconsider its classification of projectionists as non-essential. Pete Wood, I. T. O. secretary, made the following statement:

"We are informed that the Essential Activities Committee of the WMC has turned down the request of the I.A.T.S.E. for the listing of projectionists as 'necessary' men. In making this announcement Collis Stocking, chairman of the Essential Activities Committee, pointed out for the first time that the naming of motion picture production among the essential activities was definitely intended to exclude other branches of the industry. We hope the WMC will reconsider the matter to the end it will extend to exhibition at least the same treatment it gives producers."

The discrimination by WMC has brought forth the thought that if producers are permitted to make films, including war shorts by the government, they will not serve any purpose unless there are projectionists available to place these pictures on the screen.

WPB Cooperation Assured at Atlantic Coast Section Meet

ASSURANCE of government cooperation in assisting theatres in keeping open for the duration was the theme of a paper read by A. G. Smith, Acting Chief of the Amusement Section of the War Production Board at the March 25th meeting of the Atlantic Coast Section of the Society of Motion Picture Engineers.

Following the reading of the paper, "Activities of the War Production Board in the Motion Picture Field," in which Smith outlined a number of vital functions of his department and the manner in which it has been working with the industry, Dr. Goldsmith, Chairman of the Atlantic Coast Section, threw the meeting into an open forum in which various points in the paper were discussed.

Of particular interest to many of the members present at the meeting was Smith's statement regarding the servicing of sound equipment:

"It has now been established with officials of the Office of Price Administration that motion picture sound engineers should receive consideration for additional gasoline rations. On March 15, 1943, the Office of Price Administration issued Rationing Order 5C, which specifically establishes the essentiality of this form of travel and authorizes supplemental gasoline rations. This means much to the motion picture industry in making it possible for the service engineer to maintain his regular schedule of calls in servicing sound equipment. It is suggested that the projectionist take every precaution in the repair and upkeep of his equipment in order that emergency travels to a theatre may be held to a minimum."

This well attended meeting was the sixth of a series being held by the Society for the purpose of cooperating with the Government's Conservation Program to enable theatre owners, managers, and projectionists to get the best possible use of their equipment under the present unusual conditions.

ASTORIA STUDIOS SCENE OF APRIL 29 S.M.P.E. MEETING

Announcement is made by Dr. Alfred N. Goldsmith, Chairman Atlantic Coast Section of the Society of Motion Picture Engineers, that Colonel Melvin C. Gillette, Commanding Officer, U. S. Signal Corps, Astoria, Long Island, New York, has extended an invitation to hold the next meeting of the Atlantic Coast Section at the Astoria Studios, on Thursday, April 29.

OFFER PRIORITIES PURCHASE PLAN FOR RCA PRODUCTS

Forward-looking exhibitors may apply now for post-war deliveries of RCA sound and other theatre equipment which is not being produced during the war period. A "Purchase Priorities Plan" has been evolved by RCA Victor which offers a preferred position for a theatre owner on the "priority purchase" list, as well as a method of building up an interest-bearing cash reserve for the owner to apply against his post-war purchases. The plan is available to those who contemplate entering the theatre business as well as those already in the field.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random; fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Emergency Operation of TA-4144 Power Units

In case of failure of the exciter supply TA-7351, the TA-4144 Power Unit will furnish exciter lamp current. In many installations, a wire has been pulled from the TA-4144 Power Unit to the TA-7351 Power Unit for this purpose. A note was left in the units outlining the procedure for emergency operation. It is also suggested that a small note be posted on the outside of the unit, being a constant reminder of the emergency hookup available.—A. E. NOLAN, *RCA*.

Removing Foreign Matter From Film

Here is an easy way to remove any foreign matter such as hair, lint, or dirt, which might get into the aperture of the projector while the machine is running. Use a little oil or clean grease on the emulsion side of the film applied on the upper intermittent loop. As the film travels down past the aperture all foreign matter will adhere on the spot where the oil is applied. Mark the spot well on the reel below so that the film can be cleaned upon rewinding. I have tried this method under some very stubborn conditions and have found it very successful without the necessity of stopping the show.—NAT RIPP, *RCA*.

Checking Relay Contacts

Relay contacts occasionally continue to arc even after careful cleaning. This can be detected by holding a small mirror under the relay and darkening the projection room. If the relay is still arcing, it will be plainly visible in the mirror.—HALL PROSSER, *RCA*.

Conservation of Stop Pins

In the MI-9701 Fader Switch, one of the three stop pins receives more wear than the others because in normal operation it is continually swung back and forth from No. 1 to No. 2 position. When this pin begins to show wear, it is advisable to transfer operation to one of the other two pins. This can easily be done by changing the inputs to the switch as follows:

At the terminal board connect the external input wires from machines No. 1 to No. 3 on the board; connect machine No. 2 to No. 1 on the board, and connect special input No. 3 to No. 2 on the board. These wires should be plainly tagged so that when checking the switch connections one will know exactly what change has been made. The knob should then be given a one-third turn so that the proper machine is indicated. This procedure will greatly increase the life of the stop pins. Frequent cleaning and lubrication of these pins will reduce the wear considerably.—R. O. NORTHROP, *RCA*.

Matching a High Impedance Output to Amplifier

A PEC transformer makes a good matching transformer on any equipment having a low impedance input for matching high impedance microphone or phonograph pickup.—A. C. HOLLAND, *RCA*.

Simplifying Removal of Fuses

By winding a piece of friction tape about 3/8" wide by 1½" long around the small 1, 2, or 3 ampere glass fuses, they can be removed or replaced very easily without danger of getting a shock. This same procedure may be followed to facilitate the removal of any type fuse. —G. E. REIGER, *RCA*.

Improving Operation of Victory Carbons

Since these carbons have a higher resistance than the old ones, there is considerably more variation between a full trim and a stub than there was on the old carbons. For this reason, some projectionists leave only enough carbon projecting from the jaws to run the reel in the machine rather than clamp a new carbon near the end. In this way, the resistance is lower and there is less trouble with erratic speed. The projectionist has to reset the carbons for every reel but the arcs burn more steadily. —B. D. DOUGLAS, *RCA*.

Precaution Against Shorting Power Unit Transformer

As a precaution against shorting plate and filament when installing or removing a No. 29225 Rectifier from the socket in an MI-9520 Power Unit, a calling card may be placed between the plate contact and the tube base. The card may be extended down between the shell of the socket and the porcelain, thus giving good protection when changing tubes while the transformer is being used for emergency a.c. exciter lamp operation. —CARL WELSHER, *RCA*.

Reconditioning Equipment Damaged by Fire

In covering a fire job recently where one of the projectors and soundheads were badly damaged by fire, considerable experimenting was done in an effort to find a satisfactory solvent that would remove the burned film and smoke from metal and glass projector and soundhead parts easily and without damage. It was found that acetone, obtainable at all drug stores, cleans the glass parts quickly and with very little effort, while the metal parts may be cleaned with peroxide. (Acetone has very little effect on metal.) The parts should then be wiped thoroughly dry and oiled to prevent rust or corrosion.—C. R. SHEPARD, *RCA*.

Emergency Exciter Lamp Operation

Since the physical characteristics of a 27-volt, 1-ampere exciter lamp is the same as a 10-volt or 7½-volt lamp, a 27-volt exciter lamp can be used in emergency to replace either of the two lamps if a rectifier supplying 27 volts to an arc lamp is available. There are many of these rectifier sources available and it is an excellent idea to carry a 27-volt lamp as an emergency spare. If the arc lamp supply is a generator, the voltage is in the vicinity of 45 volts. A low-voltage bulb, the type used in battery-lighting emergency systems, will give the correct voltage drop when connected in series with the 27-volt exciter and arc supply. A suitable resistor may also be connected in series with the 27-volt lamp to provide emergency operation. — ANTHONY W. FALCONE, *RCA*.

Conservation of Replacement Parts

When the stop plate for the pressure roller assembly of the PS-24 soundhead wears so that a notch forms at the retaining pin and the pressure roller is not held sufficiently close to the drum, drill two holes at the opposite end and turn the plate. This method eliminates replacement of the entire stop plate.— W. WALL, *RCA*.

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In The

SPOTLIGHT

By *HARRY SHERMAN*

AS AN aftermath of the recent night club disaster in Boston where about 500 lives were needlessly lost, many of the I.A.T.S.E. State Associations are working hard trying to obtain legislations that would protect the patrons and employees of motion picture theatres against fire hazards. We have received many letters from all parts of the country in reply to an article that appeared in this department (*January* 1943) relative to the aforementioned catastrophe. In a most interesting and illuminating communication George A. Hartnett, Secretary of the Iowa State Association, writes as follows:

"We have no state law in Iowa to protect the lives of patrons and employees of motion picture theatres. A person may, if he wishes, open a motion picture theatre in a barn, seat the patrons on bales of hay, set up the projection machine in the haymow (projection rooms being considered unnecessary), and there is no law in this state to prevent it.

Many of the motion picture theatres in this state are located on the second floors of flimsy buildings, over stores and shops, have no projection rooms, and have but a narrow stairway that serves as both entrance and exit. Every year numerous fires break out in these places, but up to the present time our state legislature has failed to provide the much needed protection for the patrons of these death-traps.

For the past ten years our State Association has tried unsuccessfully to secure legislation that would remedy this dangerous situation, and this year, despite the fact that we are faced with tremendous opposition from all the fire-trap theatre owners in this state, we have again introduced a bill that would regulate the licensing and annual inspection of all places of public assembly where motion pictures are shown."

We suggest that the legislators of the state of Iowa be contacted personally by the members of the State Association. to convince them of the urgency of the passage of the bill now before the General Assembly. It boils down to a case of dollars (the exhibitors') versus human lives!

● Owen F. Nugent, president and business agent of Local No. 415, Tucson, Ariz., is very active in all matters concerning labor. His recent appointment by the governor of Arizona as a member of the State Board of Institutions has been unanimously confirmed by the state senate. Nugent has served as vice-president of the Tucson Trades Council; was vice-president of the State Federation of Labor; on several occasions he was inducted as a special representative of the I. A., and is now a member of the Appeals Tribunal of the Unemployment Compensation Commission. He is very well known and highly regarded in his part of the country.

● Bill McGee, member of Local No. 110, Chicago, Ill., for the past 30 years has passed on. Bill was a real old-timer, and was employed in the downtown theatres in Chicago for many years.

● We have just learned that Irving Cummings, the famous director of motion pictures in Hollywood, was at one time a projectionist and member of Local No. 233, Buffalo, N. Y. . It seems that Pat Powers, the old-time big shot, appeared at a meeting of the union and asked for a certain number of men to accompany him back to California. He guaranteed each man a job, and one of the eight men who accepted his offer was Cummings. Incidentally, we were also told that Cummings still owes old man Schmidt two bits from a crap game.

● Jimmy Ambrosio, the fighting treasurer of Local No. 306, New York, N. Y., ran quite a fever not so long ago worrying about an $18.07 bill which was finally paid by the local. He is subbing for Charlie Beckman, who had a relapse from his recent illness but is now coming along very nicely. Jimmy resents the fact that the new commander-in-chief of the Italian Army bears the same name as his—and vehemently disclaims any relationship.

Harry Sherman

● James Edward, Jr., closed the Elmonte Theatre in El Monte, Calif. in protest against a proposed city ordinance tax of one cent (1c) on each admission ticket sold. The exhibitor claimed that the proposed penny tax represented the difference between profit and loss to the theatre. *RESULT*: The city council quit cold on the deal and pulled the resolution.

● The Chinese government has issued an appeal for 500 16mm projectors for educational and entertainment purposes. If any of our readers would like to help our ally by donating movie equipment, please get in touch with your local authorities and they will put you in contact with the proper agencies.

● Clarence Jalos. projectionist at the State-Lake Theatre in Chicago, Ill., reports that the members of Local No. 110 have voted to donate one day's salary to the Red Cross. By the way, we have learned that this local has already purchased War Bonds to the tune of $100,000.

● I.P. congratulates Al Johnstone, Local 293, New Orleans, La., on his recent appointment as International Representative of the International Alliance.

● Allen Smith, successor to Chris Dunphy as Chief of the Amusements Division of the War Production Board, was formerly a member and trustee of Local No. 249, Dallas, Texas. In discussing the affairs of state with the writer. Smith asked to be remembered to all the members of Local 249, especially Red Rupard and Harvey Hill.

● A report released by the Connecticut Employment Security Division states "*where women have been substituted as assistants in theatres, it has been found that two women are required to replace one man.*" This should prove interesting to those exhibitors who are trying to place women in the projection rooms of their theatres.

● The Canadian Home Defense is bolstered by Local No. 440, St. John, N. B. The entire local union membership has joined the reserve force of the

Royal Canadian Artillery. They train for two hours each morning, before reporting for work in their respective theatres, in addition to their regular week-end maneouvers. These men exemplify a fine spirit of patriotism—if they cannot serve with the fighting forces, they will do their bit at home by protecting their part of the country against a possible invasion by the enemy.

● W. A. Reed and W. W. Lucas, secretary and business agent, respectively, of Local No. 439, New London, Conn., are two of the youngest looking grandfathers it has been our good fortune to meet. Each one looks not a day over 35—in fact they look as though they discovered the Fountain of Youth.

● Some time ago the ushers, cashiers (female) and janitors employed by the 20th Century Fox Theatres in Butte, Montana organized a labor union, and they recently requested that their salaries be raised from $15 to $18 per week—an increase of $3 per week. Despite the fact that living costs have soared sky high, the management generously (?) offered them a weekly increase of $1, which was, of course, refused. The projectionists employed at these theatres refused to cross the picket lines formed by the strikers and the theatres had to close down. A settlement was finally reached with the female employees, but the management refused to permit the projectionists to go back to work unless they agreed to cut the manpower in the projection rooms 50%—from two men per shift to one man per shift. The two men per shift rule had been in effect in that city for the past twelve years, and the projectionists union, Local No. 94, had no intention of giving up a condition which they fought so hard to obtain. It is not very easy to get scabs in that part of the country and once more the theatres had to close down. Finding themselves up against a brick wall, the management acceded to the terms of the projectionists and "permitted" them to return to work under their former conditions—two men per shift. The case was brought before the NLRB by the management and the final decision is still pending. However, it is our opinion that the NLRB cannot dictate to a union on the number of men to be employed in a projection room, particularly when a contract calling for a specified number of men has been in effect for twelve years. Incidentally, the parent organization of the theatres involved in this dispute made a profit of *only* $10,000,000 last year!

● Harmon J. Smith, member of Local No. 253, Rochester, N. Y. since 1912, was a recent visitor to the offices of I.P. Smith was elected treasurer of the Central Trades and Labor Council, and has recently been appointed Senior Labor Representative of the Labor Division of the War Production Board. He will work with labor-management in the New York-New Jersey areas, and we can safely

Harmon J. Smith

wager that with Harmon on the scene there will be very little dissension, if any, between labor and management. I.A. locals throughout the country, particularly those in the state of New York, that are involved in controversies of any sort, are invited to communicate with Smith at his New York City office—122 East 42nd Street—and he will be very glad to assist them wherever possible, either by personal contact or by referring them to the proper governmental agencies. He is most sincere in his desire to help his fellow craftsmen, and we believe his offer of assistance is the finest thing to come our way in a long time.

● A certain wise guy in Portland, Maine, thought he could grab off a few extra sheckels for himself by running a show for the local shipyard workers. He rented a theatre (of which he was the manager) and sold a number of tickets at $1.50 each. The night of the ballyhooed show arrived and after a period of waiting the workers became restless and demanded the return of their money. A riot was started and when the manager of the theatre was hailed to court he was fined for running a show without a city license. It was also discovered that he not only ran the projection machine without a license, but that he had the doors of the theatre locked. For the last, and what we consider the most serious offense, the janitor of the building was fined while the manager was merely reprimanded! What if a fire had broken out in the theatre while the doors were locked? There would have been another Cocoanut Grove disaster with the usual outcry against the authorities for not providing the people of that city with proper fire regulations. What a swell chance for the Maine Local Unions to band together and demand two exits from each projection room, and insist that the state legislature enact laws WITH TEETH in them that would prevent panic and fire in places of public assembly.

● John Scanlon, projectionist at the Rickingham Theatre, Bellows Falls, Vt., recently proved himself true to the tradition of the theatre—"The Show Must Go On!" Mrs. Scanlon, expecting a "bundle from heaven" (with due apologies to W. W.), called at the projection room of the theatre where her husband is employed and requested that he telephone for a taxi to take her to the hospital. However, before he could say "jack rabbit" the projection room was converted into a maternity ward and Mrs. Scanlon delivered her baby. During the entire proceedings, Scanlon continued with the show and the patrons of the theatre were totally unaware of what was transpiring in the projection room.

● As we promised last month, here is the Resolution passed recently by Local No. 171, Pittsburgh, Penna., and which should prove of interest to all other I. A. locals:

WHEREAS:

The members of Local Union No. 171 believe that all members who have enlisted or who have been inducted into the services of the United States Government should be given equal opportunity with those members remaining at home to bid for positions vacated under the Seniority Law, and

WHEREAS:

It is expected that many of our members will volunteer or be inducted into essential War Industries, and

WHEREAS:

The members of Local Union No. 171 believe that the performance of such vital service to our Country in time of War should not deprive any member of any of the rights and privileges granted him under the Seniority Law; therefore be it

RESOLVED:

First. That all members who have or do enter into such vital War Services shall be permitted to return to the positions held by them at the time of such entry, upon their discharge from such service; provided, however, that such position was a permanent position lawfully acquired under the Seniority Law.

Second. That the final assignment of all positions shall be frozen as of January 21, 1943.

Third. That within thirty (30) days after the discharge from the services of the United States Government of the last remaining member in such services, all positions vacated under the Seniority Law in the interim shall be posted in the Bulletin Board and those members who have served their country, either in the services of the United States Government or in essential War In-

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Projector Drive Problem Is Solved By I.P. Contestants

I.P.'s Contest Question for February, "How do you keep your show going when the device that couples your drive motor to your soundhead fails?"—was a purely mechanical problem in contrast to the electronic problems previously presented. For some types of soundheads the solution was definitely on the complex side. For example, suppose you had one of the original WE Universal Bases and just the main drive shaft failed, how would that be overcome? This particular type of soundhead presents several difficult problems in case of failure. Other types are somewhat on the complex side, while still others are comparatively simple. The latter are encountered in many of the more modern heads, such being evolved during the development of the art.

Belt Drives Simple

A belt driven projector is undoubtedly the simplest, that is, of course if you can readily obtain a belt suitable to transmit the required power and maintain constant speed. The substitution of a round belt for V-type means more of a tendency to slip and in an extreme case might give a little trouble. As many of you undoubtedly know, V-belts are used to increase the area of belt in contact with the pulley. The friction developed between the belt and pulley is directly dependent upon the area in contact. Also the wedging action of the V-belt aids in this respect. If there were no friction there could be no transmission of power. This is fundamental. Therefore, in a belt drive, the belt is always tending to slip on the pulley; in fact it is said that there is always an infinitesimal amount of slippage on all belt drives. The amount of slippage is dependent upon the character of the surfaces in contact and the pressure. The smoother the surface the more tendency to slip. Belt drives must be kept clean and free from oil. Otherwise friction will not be constant and the drive cannot be expected to operate at constant speed.

Soundheads driven through a flexible coupling and a gear box form a large class, and constitute the more modern types. The drive motors are frequently mounted on rubber to reduce the vibration transmitted to the projector through the coupling and also through the mounting bracket. Means are provided to obtain exact alignment between the motor and gear box shafts. Thus, we find that the coupling serves two purposes, to reduce the transmission of vibration and to transmit the necessary driving power. It can be seen readily that the use of a rigid coupling would result in increased vibration and, while in an emergency almost any device would be satisfactory, the rigid coupling should be replaced just as soon as possible.

Flexible Couplings Have Dual Personality

The flexible coupling also serves to cushion the shock of the starting of the motor. When you figure that an 1800 rpm motor reaches its full speed in from three to four seconds, on the average, the rate of acceleration must be extremely high. Now, objects at rest tend to stay at rest and objects in motion tend to stay in motion. So when we attempt to start or stop a device it tends to resist that operation. So, when the motor switch is closed, the motor tries to start instantly while the projector wants to remain at rest. The result is that an initial starting strain many times the running torque is impressed on the coupling. This is a torsional or circumferential stress which tends to split the coupling.

A length of garden hose has been proposed as an emergency substitute for a coupling and while we have not tried it, the above discussion indicates that unless it were extra heavy and of particularly good quality it would fail rapidly. Also it would have so much torsional resiliency that there might be a tendency to hunt; that is. the slight change in load in the projector, due to the intermittent, might be reflected back to the coupling and a mechanical oscillation take place. The result then would be a warble note in the sound. Another caution would be the method of clamping the hose to the shafts. Since the initial starting shock is severe there will be a tendency for the hose to slip on the shafts and so slow up the starting period. In fact this period might be so long that if the cues on the film were followed, changeover might be made before the projector is up to speed. We all know what that does to the sound. So while a good grade of hose might be used as a last resort, it is essential that it be securely clamped to the shafts, and it should be replaced by a more reliable device as quickly as possible.

We always have our troubles in selecting the prize winners in these contest questions. The answers are so uniformly good that we have to consider each and every one very carefully. So far none of the contestants have missed the problem entirely. They may offer what may be considered a less practical solution or one that is more complicated than the problem warrants, but they would keep the show going and that is what counts.

Carmine Doino, the first prize winner, has chosen the type of soundhead that is driven through a flexible coupling and a gear box. He has assumed that both the coupling and gear box have failed and proposes to adopt the following procedure:

"I would remove the motor and clean out the device in my soundhead where I had the trouble and see that all stripped gears or master shafts are removed, so as to avoid stripping gears in the balance of the machine. Then I would take the crank and try to run it by hand to see that all gears are free from trouble. If so I would proceed to reline my motor for a belt drive. I would put my motor on an iron stand and put a one-inch grooved pulley on

Grand Prize Award in I. P. Contest

The I.P. Contest questions and answers appearing during the past several months have brought out graphically the knowledge of practicing projectionists throughout the United States and Canada, with the answers to the final question in this contest to appear in the May issue, together with a listing of the regular monthly awards.

In a succeeding issue the **Grand Prize Award—a $25 War Bond**—will be announced. The award will be made to the contestant who has made the most consistently outstanding showing.

The March question was the last one in this particular series, but a new contest—unique and interesting—will be announced within a short time.

the motor shaft and proceed to put a counter-shaft with two pulleys, one 1″ grooved pulley and one 5″ grooved pulley on the counter-shaft. The speed of the shaft when hooked up from the motor to the 5″ pulley will give the speed of the shaft as 1/5 of the speed of the motor. Then I would line up the 1″ grooved pulley on the counter-shaft with the crank-shaft gear of the projector head which is also grooved, and use that gear as a drive. The crank-shaft gear will take care of the sound-head as before I had trouble the sound-head drove the projector. I would make a slot in the housing of the projector head so that the belt can enter to drive the gears, which reduces the speed of the projector to 1/20 of the motor. Thus normal speed of the projector will be obtained."

Fred Bendell, the second prize winner, has soundheads that are driven in the same manner and he has assumed that only the coupling fails. Here are excerpts from his solution:

"I would keep the projector going by using a metal sleeve that comes with the equipment to align the soundhead shaft and the motor shaft. This shaft is slipped over the soundhead shaft and then the motor is brought in to line by adjusting the bolts on the bracket holding the motor. When motor shaft and soundhead shaft are in perfect alignment this sleeve slips over both shafts with ease. Now I would drill and tap holes for screws about $\frac{1}{4}$-inch from either end of the sleeve and then slip the sleeve over the soundhead shaft and motor shaft and tighten up the screws and so couple my motor to the soundhead. I have already taken off our coupling and tried this sleeve out. I find that there is a little more vibration to the machine, but it does not affect sound or picture. I find that this sleeve could be put on between reels."

George J. Beltz, the third prize winner, also has the same type of drive and he likewise assumes that the coupling, only, fails. You will note from the following quotations that his approach is quite a bit different:

This coupling is really a sort of filter acting between the motor and sound-head and assembled with three pieces of metal. One piece is locked with set screws on the shaft of the motor and another on the shaft of the gear box. The third is set in a floating position so as not to touch the other two. This position is held and maintained by a heavy composition ring riveted on both sides of the floating bar and to each of the metal clamps on each shaft. * * * To make an emergency repair, leather belting could be threaded through the clearance between the metal parts and the entire coupling could be held together with heavy twine tied around it to keep the belting in place. If this is not available a piece of rubber innertube could be used instead, or even lightweight sash cord pounded flat and inserted to keep the show going for the night. After the show, couplings could be taken off the shafts and new rings made from shoe leather could be riveted to the proper parts."

Frank C. Champlin proposes to substitute a belt drive for a coupling that has failed. He uses two pulleys of the same diameter in the following manner:

"By taking two pulleys for use with a V-belt, and placing them on the two respective shafts and coupling them together with a V-belt you are on with the show. Of course it is also understood that the motor must be placed on an improvised mounting so that the shafts are in proper relation to each other to enable you to use said arrangement. Use of a V-belt greatly lowers the chance of slippage and it is believed that with proper alignment and care not a particle of difference between the two drives would be noticed. Use of two pulleys on each shaft and two V-belts would cinch the matter, but these shafts are not long enough to accommodate such an arrangement. The hardware store has the pulleys and there are lots of employees' cars having the V-belts that would work in a pinch, although the proper thing is a belt to fit the taper of the pulleys."

John Lawrence solves the problem by using a flat belt in place of chain drive. We acknowledge the solution as ingenious, but the belt is rather narrow and before committing ourselves to its workability would like a report that it has actually functioned. Anyway here is his proposal:

"If this chain link belt were to break I would immediately send for a $\frac{5}{8}$″ flat leather belt. I would fasten the ends with rawhide lacing and use the belt instead, using the gears as ordinary flat pulleys until closing time. I would then proceed to fill the teeth of the gears with lead or plastic composition to make a flat running surface."

Raymond J. Mellien would use garden hose as a substitute for a flexible coupling, but recognizes the possibility of slippage between the coupling and the shafts. He writes:

"Therefore, in case of emergency I would purchase from a hardware store a piece of garden hose $\frac{1}{2}$″ in diameter. This piece of hose is to be slipped over the two shafts to act as a flexible coupling, but before applying the hose, I would give the two shafts a coat of rubber or patching cement. This would help prevent slipping due to the quick starting of the motor. Of course, a hose clamp on each end of the hose, over each shaft, is necessary to be sure of a tight fit."

Maurice Rushworth not only considers the possibility of the flexible coupling failing, but also that trouble may develop in the gear box also. With regard to the coupling, he proposes:

"The actual coupling can be easily replaced by a small length of garden hose and clamps. Both shafts have flattened surfaces for the set screws and if the hose is split, fitted and the two straps bound tightly, I see no reason why the temporary repair should not last for 'some weeks'."

He then proceeds to take care of trouble in the gear box as follows:

"In case of teeth stripping, an expert machinist could cut new teeth if the metal had first been built up. * * * In normal times it would not be such a problem, but now it would be almost impossible. The best I could do would be to contact a friend of mine and after having the metal built up attempt to hand cut the teeth, hoping that the matching would be good enough so that vibration would not be transmitted through the system. * * * It is possible that the Woodruff keys might split. There would be enough of the key left to use if solder were dropped in the slot. You couldn't solder steel, but the key will keep the solder in place. Drop solder in the slot, fit the key and if necessary grind down a little."

H. D. Taylor, has selected a length of heater hose as a substitute for the flexible coupling. Here are excerpts from his analysis:

"A size of heater hose available at automobile supply stores has an inside diameter of $\frac{1}{2}$″, which will fit snugly over the shaft ends. The supply store also can furnish clamps that are made to fit around the outside of the hose. To avoid any tendency of the hose slipping on the shafts, the flat on the shafts and the part of the clamp that carries the clamping screw can be placed adjacent to each other and the clamps tightened until the hose takes the shape of the shaft at that point."

As an alternative, in case the hose and clamps were not available he would arrange a belt drive, using available grooved pulleys. He is fortunate in having two $1\frac{3}{4}$″ pulleys that are grooved

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Peace-Time Planning Means War-Time Projection Room Efficiency

This is the saga of Harry Rubin, Supervisor of Projection for Paramount Theatres. It is the story of the pioneer whose vision and skill and whose practical application keep the films turning and the entertainment uninterrupted. His career has been exceptional. He was an early member of New York City Local No. 306, and "chief" when that was a new title in the motion picture field. Later, as Director of Publix Theatres Sound and Visual Projection Department, he traveled widely, visiting all the leading motion picture theatres in this country, Europe, and Canada. He has always been an active and progressive influence, and as a member of the American Projection Society, Projection Advisory Council, and Chairman of the Society of Motion Picture Engineers' Projection Practice Committee, made noteworthy contributions to the technical advancement of the industry.

By *WALLACE BENNETT*

SMOOTH operation of the projection rooms in the Paramount Theatres, in effect, is the lengthened shadow of the man responsible—Harry Rubin—supervisor of projection for the big organization, who has a record covering thirty-five years in the field. For twenty-five of those years he has held his post and title, and has been responsible, in his own right, for progressive development of the circuit's projection rooms.

He was a pioneer in the industry—and an outstanding pioneer. His vision. his inventive genius and his persistence, have been working from the day he entered his first projection room, and have lifted him to the very top of his profession. He is a man worth knowing, and his ideas are figurative pay-dirt for the qualified projectionist and for the apprentice who has an ambition to achieve bigger and better things.

With his many responsibilities, his strongest love, as might be expected, is for the New York Paramount Theatre, stellar unit in the country-wide chain, and what he did and is doing for its projection room always is news.

As a man really worth talking to I dropped in to see the master projectionist the other day and, with his multitude of worries, he still had time to tersely tell me something of the behind-the-scenes developments of his smooth-running world.

The first thought that struck me as we chatted was that projection rooms that were planned and operated properly and efficiently during the now almost-forgotten peace era are returning dividends in the way of maximum efficiency under war-time conditions.

Let's take a look inside the active brain of this supervisor of projection for Paramount: In our conversation he stuck pretty closely to the projection room of the New York Paramount Theatre which he planned exclusively something over sixteen years ago when the structure was in the blue print stage. It was then a model of its kind and after sixteen practical years it still stands as a model and one of the outstanding projection rooms in the world. While it was built in the old "silent" days it was converted quickly to sound films without any major rebuilding.

The Paramount projection room has such features as double exits, air-conditioning, a complete wash room, drinking fountain, a clothes locker room and a combination storeroom and workshop. Another feature is a series of vented film cabiets, which are located just behind the three projectors, with doors on that side and additional doors on the other side of the wall in which they are placed. Films may be put in these cabinets on either side, with a minimum of distance being covered with the exposed film, an excellent safety feature. When a reel has been used it is easily placed in a cabinet, located only a few feet from the machine, with the film being exposed for only a few seconds. Then when it is to be re-wound it is taken through the opposite door in the rewinding room. completely segregated from the projectors.

We in the trade know that the projectionists at the Paramount do more than "put a picture on the screen." Under Rubin's tutleage they have become showmen, greatly adding to the entertainment value of the show by the regular use, of three projectors, one flood, one slide projector, two spots, and two effect projectors. Duplicate equipment is one of the secrets of the success achieved, and the room always is manned adequately to handle the equipment, with the results outstandingly successful from an artistic standpoint.

To those who know the real Paramount Theatre it is not news that this success can be traced directly to advance and thorough planning of all shows presented. The complete show—pictures, stage entertainment, effects. organ music and band—is timed to the split second and presented with the highest degree of showmanship.

A number of devices were originated and developed by Rubin, one in which he pioneered being the magnascope, introduced some years ago, which widens the normal 24-foot picture on the screen to 44 feet. Another is the effects—subtly presented and coupled with proper timing—being the only scenery used in Paramount shows. Still another—lately developed—is a carbon receiver which is fitted into the lamphouse. This safety feature is an arrangement which permits a hot carbon stub to be placed in a receptacle in the lamphouse, where it remains until it has cooled off. This origination was designed to eliminate the hazards present when removing hot carbon stubs from the lamphouse, and to avoid the possibility of ignition of film or any of the other highly inflammable materials usually found within the projection room.

The value of the third projector is emphasized, as well as additional equipment for pre-setting effects in order to secure a more accurate and smoother performance. Even during war times interruptions are not excusable. Foresight and proper precautions usually

Harry Rubin

have been neglected when breakdowns of any equipment occurs. Pre-setting is helpful but not always necessary.

Should a fault develop in one of the projectors at the New York Paramount Theatre, it is possible with the extra or duplicate equipment always on hand to carry on with the show without any loss of entertainment value.

Rubin is a firm believer in the idea that supplementary equipment gives better distribution of wear, and that is one of the reasons why high standards always have been the rule at the Paramount. Every single piece of equipment is kept in top-notch condition at all times; gears, sprockets, tubes, and other parts are replaced before there is the slightest chance of trouble. To date there never has been a delay in the performance of a Paramount show and, of course, this is largely due to the installation of the duplicate equipment and its proper care. With the reserve equipment available it never is necessary to use any piece that shows the slightest sign of trouble. When trouble does appear the equipment is switched out of service until it has been repaired. In the meantime the show continues with perfect results.

From the foregoing the thought may arise that maintaining these top standards may indicate a disregard for costs. But that certainly is not the case, for pennies are pinched at the Paramount Theatre so closely that even stringent war conservation found that nothing in addition could be conserved excepting the salvaging of copper from carbons, and the metal from discarded parts—items that have practically no value during peace times. Carbon savers have been used ever since the theatre was opened.

The Paramount projection staff is trained to maintain high standards of showmanship. The men are exceptionally qualified through their long experience and knowledge of electricity, optics, and mechanics. Rubin's requirements undoubtedly are exacting but his men constantly strive to maintain his standards—he expects them to be practically infallible.

Rubin points out that in most lines workmen can correct their mistakes before the product is delivered to the customer. Projection room mistakes, however, reach the patron at the instant they are made and reduce enjoyment of the show. Poor projection lessens the entertainment value even when the customer is not aware of a defect or its cause. To guard against mistakes and breakdowns is the big reason why Rubin observes so may precautions—and they have paid big dividends in constantly smooth operation of the show during the years he has been with Paramount.

Above are three views of the New York Paramount projection room. Top view shows the 3 projectors, 2 spotlamps, 1 floodlamp, and 1 slide projector. Center view shows the film cabinets, sound system and switchboard. Lower picture is a view of projectionist Sam Selden placing a reel of film in the cabinet to be rewound, and projectionist Meyer Schonkman is shown removing a reel of film in the rewinding room. (The door between the projection and rewind room is always kept closed, but was opened for purpose of this picture).

AT YOUR SERVICE

(*Continued from page* 13)

Quick and Easy Method of Determining a Defective Tube

In the event sound is lost in an amplifier and all tubes appear to have a lighted filament, an easy and quick way of determining which tube is defective is offered in the following methods which may be used on all types of amplifiers:

1. By touching the grid cap of high gain tubes with the hand and by holding the other hand in close proximity to an electric light bulb, or an unshielded light cord, an a.c. hum will be introduced in the amplifier output if that and succeeding tubes are functioning properly.

2. Another and sometimes easier method is to remove a tube from its socket, starting at the first tube and working back as it is replaced after removal. A sharp click or thump should be heard if all succeeding tubes are functioning. If the amplifier remains dead when the first tube is removed, pull and replace the second, the third, etc., until the thump is heard which indicates the succeeding tube is bad. This will work even for the output tube.—D. C. Ferguson, *RCA*.

Cleaning W. E. Motors

The seals of the Western Electric motors become very dirty in operation and should be cleaned regularly. Due to their construction, this is quite a job except when done with forced air. Generally a vacuum cleaner with an extension tube is used, but sufficient air pressure cannot be obtained through the resistance of the hose extension for a good job. By removing the hose and using the nozzle direct, the pressure is increased many times and all dirt can be blown out without taking down the motor.—P. N. Connet, *RCA*.

Preventing Pad Roller Arm Damage

In several instances breakage of pad roller arms and brackets was traced to a shift in position of the hold-back sprocket on the shaft. This was found due to an uneven cup rim on the set screw creating an impression that the set screw was seated properly. The shifting of the sprocket on the shaft caused jamming of the pad roller against the rim of the sprocket. All screws were carefully examined and those found in the above condition discarded and replaced by set screws with an even rim. Tightening of these set screws in the correct position of the sprocket on the shaft was achieved through positioning the sprocket while the pad roller was set down on the sprocket and used as a guide. Following this procedure no further breakages have occurred to date. —J. H. McGinley, *RCA*.

● BUY WAR BONDS ●

Alex Polin Passes

THE untimely death of Alex Polin, member and former officer of Local No. 306, New York, N. Y., was a shock to the entire membership. It marked the end of a brilliant career which won the respect of both his friends and his enemies. Al, as he generally was called, devoted the major portion of his life to union matters, and he was the stormy petrel that kept the pot boiling. The welfare of Local 306 was the focal point of his life.

The keen mind and independent spirit of Al Polin was a combination found in few. His judgment in union matters was highly regarded, and his conclusions were always based on knowledge and understanding. Al was a union statesman and much constructive union legislation is connected with his name. He fought with tenacity for his principles and never forsook the underdog. His *knowledge* of Local 306 Constitution and By-laws was surpassed by none, and he was considered its foremost parliamentarian. Although he was in the forefront in all 306 political affairs, Al held but few elective offices.

Illnes slowed Al down during the past year and he never fully recovered from a serious operation he underwent last summer. His passing has created a vacancy in our ranks, and his loss to both Local 306 and the I. A. is an irreparable one these critical days. He will be missed at the council table where his wisdom would have contributed so much to the planning for the post-war period. The esteem in which he was held was shown by the large number of past and present officers and members of Local 306 who attended his funeral and participated in the ceremonies.

Every Ounce of Copper Scrap Essential

Projectionists may aid immeasurably in the war conservation effort of the government, one angle being graphically brought to light by N. G. Burleigh, chief of the WPB Service Equipment Division, who cites that about 270,000 pounds of needed copper scrap can be recovered annually from copper coated carbons. Copper scrap is the No. 1 industrial salvage problem of 1943, and every ounce possible must make its way to the scrap pile after it has completed its work in projection rooms. You will be hearing of a planned program designed to salvage copper "drippings and strippings" from the 8.500 theatres in the country, and every 100 per cent American will work 100 per cent to produce maximum quantities. Theatre supply companies will act as central accumulation points for the drive, and money received will be donated to the Red Cross and similar organizations.

16mm SOUND PROJECTION

(*Continued from page* 8)

by the projector—even if it is blimped —you will usually get it too loud to suit the average audience.

Similarly, it is handiest, of course, to put the loudspeaker (or loudspeakers, if you have one of the more powerful outfits) on the floor below the screen. But you'll get much better sound quality, and usually better volume, if you put the speakers higher up. The ideal position is behind and slightly above the screen, pointing slightly down toward the audience.

The actual operating controls of the projector, as a projector, are usually separate from the sound controls, though they may be grouped on the same panel in some designs. There are separate switches for turning projector and sound on and off, a separate switch for the projection-lamp, and in some machines, a separate control for running the projector at silent or sound speeds.

When you start a show, remember that while the projector and the projection-lamp start instantaneously, the amplifier—like a radio—usually requires a minute or so for the tubes to warm up. So make it a habit to turn on the amplifier several minutes before the show is due to start. Some 16mm. projectors have a little telltale pilot-light to indicate when the amplifier is on and ready to operate; others don't. But you can nearly always tell when the amplifier is ready for action by one or both of two signs. In many projectors, the exciter-light at the sound pick-up doesn't go on until all the tubes are warmed up and operating. And always, when the amplifier is on and everything is functioning, you'll hear a little hiss coming from the loudspeakers, and caused by the glow from the exciter-lamp affecting the photocell of the sound pick-up and sending a little "background noise" through the reproducing system.

Anyone who has ever given silent movie shows before an audience knows that it is a "must" to have a spare projection lamp available at all times, in case the one in the machine burns out —as it always does at the most embarrassing moment. (Have you noticed they never seem to burn out when you're running your own film just for yourself—?) Well, in sound projection, you should add to this a spare exciter-lamp bulb. This is probably the shortest-lived part of the average sound projector—and without it, you just can't project sound. The photoelectric cells that translate the sound into electrical impulses for the amplifier and loudspeaker are usually long-lived, but if you can carry a spare photocell, you'd better do it. In the same way, the amplifier tubes will take a good deal more use and abuse than those in a radio, but when they go, it helps to have a spare.

WESTERN ELECTRIC PLANTS GET ANOTHER "E" AWARD

The three major works of the Western Electric Co. have done it again. For the second time they have received the Army-Navy award for meritorious services on the production front. The company, which turns out telephone equipment during normal times, now is producing large quantities of communications apparatus for the armed forces. It was among the first manufacturers to be awarded the "E" citation when that bonor first became available last year. Manufacturing employes on the payroll at that time received "E" pins, emblem of production efficiency, and, with the new award, the thousands of workers since added have received the coveted pins.

ALTEC SERVICE GETS MANY NEW SERVICE CONTRACTS

In renewing agreements for Altec Service in North and South Dakota and Minnesota, the Welworth Theatres Co., Minneapolis, has added six theatres in Wisconsin and Minnesota. Repair-replacement parts agreements for sound and projector equipment have been made part of the deal, according to R. Hilton, who negotiated for Altec.

The organization notes that exhibitors' increasing awareness of the need for conservation of projection room equipment and parts is shown in a large increase in its service contracts, with strong emphasis on repair-replacement contracts for both sound and projection equipment.

IN THE SPOTLIGHT

(Continued from page 15)

dustries, and such members who have been replaced by members returning from war effort shall be accorded the right to bid for those positions under the Seniority Law.

Fourth. That on and after January 21, 1943, any person accepting a position under the jurisdiction of Local Union No. 171, does so with the full knowledge and understanding that such position is for the duration of the national emergency.

Fifth. That, effective January 21, 1943, no person shall be admitted to full membership in this Union whose admission will alter the Seniority Standing of any Apprentice Member or Applicant of record on the books of this Union on the above date, who serves in the War Effort.

Sixth. That all previous action contrary to the provisions of this Resolution recorded in the minutes of this Union shall be, and is, hereby rescinded.

And, be in further

RESOLVED:

That a copy of this Resolution be spread upon the Minutes of Local Union No. 171, a copy posted in the offices of this Union and a copy be sent to the General Offices of the International Alliance of Theatrical Stage Employees and Moving Picture Machine Operators of the United States and Canada for approval.

Respectfully submitted,

J. W. Shawkey
Daniel V. Flask

Endorsed by

P. L. Ferry — ***Martin Torreano***
Geo. Engstler — ***David Thomas***
L. Thompson — ***Irvin Turner***
R. J. Grove — ***A. L. Criswell***
J. A. Sipe

● In the February issue of I.P. we mentioned the unfairness and predjudice of the Kenosha, Wisconsin Board of Education in rejecting two men as members of the Board because of their union affiliations. A similar case recently came up before the Board of Education in New York City, when they turned down one Mark Starr, who was the only qualified candidate out of one hundred applicants as Director of Adult Education in the New York public school system. Starr, who is nationally known as an educator and friend of labor, was rejected because, as the Board Chairman put it, "of his long record as a labor protagonist." New York City, shake hands with Kenosha, Wisconsin!

● Exhibitors and exhibitor organizations are constantly harping on the fact that unions operate as "closed corporations," and that their membership lists should be open to all applicants. BUT—have you followed the recent Momand trial in the trade papers, and have you read the Federal Court's decision regarding the case of the Crescent Amusement Company? AND—have you read of the action of the Prefect Theatres, Inc. of Connecticut against eight major film distributors — namely, Paramount, Universal, Columbia, Loew's, RKO Radio, 20th-Fox, Vitagraph and United Artists for violation of the Sherman Anti-Trust laws? "Closed corporations," cry the exhibitors when the unions try to protect the interests of their members. "Smart business," say they when they adopt the same tactics to protect their own interests. You figure it out.

THIRD DIMENSIONAL PICTURES ARE IN SIGHT

Projectionists may look for third dimensional pictures as a post-war development, with research now reported as having progressed to such an extent that such pictures are approaching a point where they will be commercially feasible. Current reports also indicate that the new third dimensional pictures will not require the scrapping of present projection equipment, heretofore one of the bogeys encountered.

Projection is said to be so perfected and practical that it is now comparable to the two-dimensional films. Up to recently no method had been devised which would permit the use of projection equipment now in use.

ASSURE LABOR-MANAGEMENT GROUP

Formation of a labor-management committee is assured with unanimous approval to the idea being given by 33 producers representing the Association of Motion Picture Producers, the Society of Independent Motion Picture Producers, and the Independent Motion Picture Producers. From tentative plans the committee will embody five or six producers' representatives, with a like number representing labor.

William Hopkins, regional director of the War Manpower Commission in Hollywood, said at a meeting of producers that the primary objective of such a committee is the "utilization of manpower in getting this war won."

Review of Projection Fundamentals

VII—Frequency and Wave-Length

THE relation between frequency and wave-length should be clearly understood—it is very simple. Think again of waves in water; think of them approaching some boundary or water's edge. Suppose the distance between one wave-crest and the next to be two feet—that is, the wave-length is two feet. Suppose the waves to be approaching the shore at a rate, or "speed of propagation", of 20 feet per minute. Then in one minute's time 10 of these 2-foot waves will arrive at the shore line. In other words, the frequency is ten cycles per minute.

The same considerations apply to any kind of waves. Consider sound waves with a distance of two feet between the center of one area of compression and the center of the next. Sound has a rate of propagation of 1,100 feet per second, very roughly. What is the frequency? How many areas of compression will arrive at the wall of the auditorium if they are spaced two feet apart and approaching the wall at 1,100 feet per second? The wave that originated 1,110 feet away (if the auditorium were that large) would arrive exactly at the end of one second. Between the wall and that point 1,100 feet away there is room for exactly 550 two-foot waves; all of which will arrive at the wall sometime in the course of one second. The frequency is 550 cycles per second.

Suppose the frequency is known, but not the wave-length. The frequency is 550, the rate of propagation 1,100 feet per second, what is the length of the wave? Well, here are these wave-crests approaching the auditorium wall each second at a rate of 1,100 feet per second. The one that will arrive in exactly one second is now exactly 1,100 feet distant. But there are 550 of these crests between the wall and the one a second's distance away. Therefore the spacing or distance between crests must be two feet.

Arithmetically, the frequency can always be found by dividing the wave-length into the speed of propagation; and the wave-length can be found by dividing the frequency into the speed of propagation. If you know the frequency of any sound—say 4,400 cycles—divide that into 1,100; the wave-length is $\frac{1}{4}$ foot, or three inches. If you know the wave-length is $\frac{1}{4}$ foot, divide that into 1,100 and the frequency is shown to be 4,400 cycles.

The formula, similar to Ohm's Law in structure, is $w \times f = r$, or wave-length x frequency = rate of propagation. This

Among those present at the March 25 meeting of the Atlantic Coast Section of the Society of Motion Picture Engineers, Hotel Pennsylvania, New York City. Left to right: Harry Rubin, Director of Sound and Visual Projection for Paramount; Martin Bennett, Director of Sound and Visual Projection for Warner Bros.; A. C. Smith, Acting Chief of the Amusements Section of the WPB; Charles F. Horstman, Director of Sound and Visual Projection for RKO; I. P.'s Harry Sherman; James Frank, Jr., National Theatre Supply Co., N. Y. C.; Dr. Alfred N. Goldsmith, Chairman, Atlantic Coast Section, SMPE, and P. A. McGuire, Advertising Manager for International Projector Corp.

can be manipulated like the Ohm's Law formula (see I.P. for Sept., 1942), to read w = r/f, or f = r/w.

The electro-magnetic waves just referred to have an altogether different rate of propagation than sound. They move at the speed of light, 186,000 miles, or 300,000,000 meters, per second. Then what would be the wave-length of a television station that tuned in at 100,000 kilocycles—100,000,000 cycles? Divide 100,000,000 into 300,000,000—the wavelength of the television station would be 3 meters.

The frequencies of waves of light may be determined by measuring the wavelengths (which can be done optically) and then dividing the figure obtained into 300,000,000 to get the frequency.

Light and Sound Frequencies

White light has neither wave-length nor frequency of its own. It is a combination of all the visible vibrations, present simultaneously and in suitable proportions. If the proportions are unbalanced, the light appears blue-white, or yellow-white, or greenish-white and so on, as the case may be.

In optical appliances, in which these visible colors (combined to form white light) are reflected and focused by mirrors or lenses, it is found that no single lens will exert an exactly equal effect on all the different frequencies of light present. It will focus some more strongly than others, with the result that the different frequencies will come to focus at slightly different locations, revealing themselves as pure colors. A glass prism shows this effect very sharply—it can be made to split a single beam of white light into all the colors of the rainbow. The rainbow, in fact, is due to just that phenomenon; white sunlight split into its component colors by raindrops. The phenomenon is called chromatic aberration.

In optical equipment of good quality, chromatic aberration is compensated by combining two or more lenses made of different kinds of glass, and of equal but opposite tendencies toward chromatic aberration. One lens in the combination compensates for the chromatic aberration introduced by another.

Complete chromatic compensation, operating exactly and correctly on all the frequencies in white light, is difficult and expensive to obtain, but commercially satisfactory compensation is found in all projection lenses and sound optical tubes in the projection room. If white light that has been passed through these appliances shows substantial color other than white at the place of focus, that is positive evidence that the optical train is out of adjustment. One method of focusing certain types of exciter lamps is to place a bit of white paper in front of the photocell, then adjusting the lamp until the light on the paper shows itself as a perfect white oval, with sharp edges and without any trace of color.

One method of breaking up certain types of echo in theatre auditoriums is to "coffer" the wall or ceiling surface responsible for the echo—breaking it up into many rectangular, deep recesses. The dimensions of these recesses, if the process is to be effective, must be determined according to the wave-length of the sound at which echo is most pronounced. Recesses one foot square and one foot deep will not have much effect on an echo which is particularly pronounced at 100 cycles. The wave is too large. On the other hand, recesses six feet square and six feet deep will not be too effective with the small waves of two or three thousand cycles.

Sound treatment intended to add absorption to the auditorium also must be guided by consideration of the frequencies at which such absorption is needed. Materials that effectively absorb the energy of large, low-frequency waves may be almost useless with their small, high frequency brothers, and vice versa. Where absorption over a large part of audible band is required acoustic materials are often combined.

INVENTION REPLACES COPPER ON CARBONS

An invention for eliminating the copper coating of carbons without sacrificing arc performance in any way is the subject of a patent application filed by Carl B. Carr of Los Altos, Calif.

Carr points out that the copper coating increases the current-carrying capacity of carbons nearly two to one, and thus makes possible the use of small diameter carbons which burn at high current densities.

His invention, he notes, does not alter any of the manufacturing specifications of carbons except by eliminating the copper coating. Neither is there any change in the lamphouse mechanisms. Carr claims that his device eliminates possible disturbance of the arc as a result of the melting of the copper coating, eliminates the hazard of molten copper sputtering and pitting optical elements, and would make possible a reduction in the diameter of present types of uncoated carbons.

I. P. CONTESTANTS SOLVE PROBLEM

(*Continued from page* 17)

to fit standard takeup belting, which he likewise has on hand.

Martin Teker has one of the older types of flexible couplings that are somewhat more complicated than those used on newer machines. He would proceed to keep the show going as follows:

"One part fastens with a set screw to the motor shaft, while another identical part fastens likewise to the soundhead shaft. These parts come close together and between and around them is another metal part that does not touch either of them. At either end of this latter part are two flexible discs, having considerable strength and flexibility and appearing somewhat as though they were made from a sidewall section of a tire. These discs are riveted to this latter part and also to the adjacent parts that are fastened to the shafts. There are two ways to keep this unit going. If one flexible disc happens to tear out at the rivets, it is possible to remove it and turn it so that a new surface is available for reriveting. This, of course, weakens the disc, but it could run for some time. . . . It would be possible to substitute a different disc, but that is doubtful since leather is not strong enough and it would be difficult to locate a section of an old tire. In case the discs and centerpiece were ruined, the only alternative left would be to drill two holes in each of the two main pieces so that they face each other. Pins could be driven into one piece. The holes in the other piece should be larger so that there would be some freedom when coupled together. These holes should be large enough so that some tape could be wrapped around the pins going into the holes. This would give it a cushioning effect which would be better than nothing at all."

And so we could continue to give many interesting angles to the solution of the problem of the emergency repair of a projector driving device. Many of the solutions proposed are not only ingenious, but practical as well and could be made in a minimum of time. And time is of the utmost importance when there is an impatient audience. Failures seem to have a very bad habit of happening when the house is crowded and not when there are only a few patrons present. We hope that each and every one will study these proposals, apply them to his own equipment and then decide just what course he will follow in such an emergency. Better still, make a substitute part, try it out to be sure that it not only just works, but that it performs satisfactorily. It should not just "get by", but should be the best that can be devised for the application. Time spent on such a device is a headache saved. Then store this device where it can be found at a moment's notice by any of the projectionists who may be on duty.

February Contest Winners

First Prize

CARMINE DOINO
1209 Bushwick Ave.
Brooklyn, N. Y.

Second Prize

FRED BENDELL
104 Alden St.
Sudbury, Ont., Canada

Third Prize

GEORGE J. BELTZ
33 9th St.
McMechen, W. Va.

Winners of One-Year Subscriptions to I.P.

FRANK C. CHAMPLIN
2629 Denton Ave.
Garvey, Calif.

JOHN LAWRENCE
Dalton Theatre
Dalton, Ga.

RAYMOND J. MELLIEN
Lake Geneva
Wisconsin

MAURICE RUSHWORTH
531 S. Longwood St.
Baltimore, Md.

H. D. TAYLOR
1516 Greenwood St.
Raleigh, N. C.

MARTIN TEKER
Sheridan
Montana

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(Just a few of the larger checks received in payment for bulk subscriptions to I. P.)

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Monthly Chat

EQUIPMENT manufacturers are trying to maintain adequate stocks of parts for replacements. In normal times customers expect that immediate shipments may be made but it is not logical to expect them during the emergency for problems of maintaining stocks now are complex. Manufacturers have difficulties in obtaining raw materials. Raw materials, however, are alloted, and manufacturers may have to wait several months for supplies—and then allotments may be reduced. An individual manufacturer applies for materials based on his records of demands. And if the demand for some reason suddenly increases all orders cannot be filled. Which all means that we will have to prolong the life of existing equipment and not become overly impatient if we cannot buy supplies immediately.

• • •

Some may feel that new parts do not appear exactly like those with which they have become accustomed. This may be so, as manufacturers have been forced to make material substitutions, on account of restrictions and shortages. This situation has forced manufacturers to investigate other materials. Sometimes these materials may be used with success while in other instances it is doubtful if substitutes will be as satisfactory. In some instances new materials will not perform as producers desire. No matter what the conditions, we are faced with substitute materials, and as the war continues there appears to be an ever-growing necessity for more.

• • •

Do not pay too much attention to reports that new parts now coming through do not fit as well, are not finished as well, or show signs of poor workmanship. It is not generally true. Although it has been necessary to train new operatives in plants, the older, experienced employes are doing a marvelous job in preventing any real deterioration in the quality of the product. We must consider the many production problems now before the manufacturers.

• • •

A timely and effective step forward has been taken in the advertising program by the International Projector Corporation with its introduction in trade publications of a new series of advertisements which are devoted to the advancement of intelligent and necessary maintenance of theatre properties and equipment. During these times maintenance is more important than ever before and the messages that will be publicized by the International Projector Corporation will be worth-while to all projectionists who have the good of the industry at heart. These are all practical messages, written and signed by practical men who know what they are talking about.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

COPPER CONSERVATION NEWS

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

ISSUED BY NATIONAL CARBON COMPANY, INC., CARBON SALES DIVISION, CLEVELAND, OHIO

Many Theatres Now Sponsor "Copper Matinees"

Novel Plan Adds Much Scrap to Our Nation's Supply

In cooperation with the War Production Board, theatres throughout the country are devoting matinee performances to the Nation's drive for scrap copper. Under the novel "Copper Matinee" plan, boys and girls are given free admission to matinee shows in exchange for a prescribed weight of copper of any type.

This plan, which supplements the drippings-saving program, has brought to light a considerable amount of metal which otherwise would not be made available for war use.

In devoting performances to the collection of copper, the country's theatres are performing a patriotic duty by adding to the available supply of this important metal. The success of the program is important to the motion picture industry, as well as to the country as a whole.

Conservation Program Nets Many Tons of Copper Drippings and Peelings

Wholehearted Cooperation by All Concerned is Reason for Success

The spontaneous response to the copper conservation program in virtually every section of the country has resulted in the collection of many tons of copper drippings and peelings. This accumulation was made possible by the active cooperation of the large majority of individuals connected with motion picture projection.

Reports received indicate that some motion picture supply houses have collected 9,000 to 10,000 pounds and more of copper drippings and peelings. This was accomplished by varying degrees of promotion on the part of these organizations. Advertising in the trade publications, direct mail and window displays showing the amount of scrap turned in supplemented the work of the field organizations in some cases.

The theatres, in turn, have done their part by turning in their scrap regularly.

While the copper-saving record established to date is excellent, it can be improved if *every* supply house and theatre in the country will give maximum cooperation.

Carbon Stubs Should be Prepared in the Theatre

Some theatres, we understand, are turning in unpeeled stubs of used projector carbons. As a result, motion picture supply houses are having difficulty in disposing of the copper scrap.

To facilitate disposition, may we urge you, therefore, to avoid mixing stubs with drippings and peelings.

Appearance of Drippings Does Not Affect Their Value as Usable Metal

Uncontaminated Projector Scrap is Shown by Test to Yield at Least 90% Copper

Difficulty has been experienced in some sections of the country in disposing of copper drippings and peelings. Because of the oxidized appearance of the metal, scrap dealers, who judge the copper by its color, will not accept these gray-colored pellets and strips as usable metal.

By actual test it has been shown that if the drippings and peelings are not contaminated by dirt or other material, they yield *at least* 90% copper.

If projector scrap is turned over to the supply houses for handling, the metal will find its way back into the Nation's stockpile without delay.

The photograph above shows the general appearance of copper drippings as taken from the projector lamp house. The color is a dull gray with a few copper-red spots visible. Projector scrap, despite its discouraging appearance, is 90% copper.

Weight of Copper Drippings From Victory Carbons

The following table shows the actual weight of drippings obtained from a unit carton of the various sizes of "National" Victory Carbons.

8 mm x 14″ "Suprex" Positive	3.2 ounces
8 mm x 12″ "Suprex" Positive	2.7 ounces
7 mm x 14″ "Suprex" Positive	1.5 ounces
7 mm x 12″ "Suprex" Positive	1.3 ounces
7 mm x 9″ "Orotip" C Negative	1.6 ounces
6 mm x 9″ "Orotip" C Negative	1.3 ounces

The trade-marks "National," "Suprex" and "Orotip" distinguish products of National Carbon Company, Inc.

INTERNATIONAL PROJECTIONIST

VOLUME XVIII MAY 1943 NUMBER 5

A Modern Inverse Feedback Amplifier

By *LEROY CHADBOURNE*

A SCHEMATIC of an AC operated, two-stage, inverse feedback, resistance coupled, power amplifier is shown in *Figure 1.* You will note combinations of resistances and capacitors in the feedback circuit, which is commonly called a warping circuit. This warping circuit is adjustable and is employed to vary the frequency response of the amplifier and therefore that of the sound system in which the amplifier is used. Further examination of this schematic will disclose that the amplifier also includes a single stage monitor amplifier, together with the associated monitor speaker.

Choke Input Filter

In the lower right hand corner is the full wave rectifier circuit. Three taps are provided on the primary of the power transformer so that the amplifier will operate satisfactorily on line voltages from 105 to 125 by proper selection of the tap. This transformer has a secondary heater winding for the tubes in the amplifier and the associated voltage amplifier. Following the output of the rectifier from the filament of the rectifier tube we pass through the reactor L_1 before we come to the other elements of the plate supply circuit. Thus we find that this amplifier employs a choke input filter. From the choke we go direct to the plate of the monitor amplifier tube, VT_6, the screens of VT_3 and VT_4 and the plates of these same tubes, through the primary of the output transformer, T_1. The only filtering in these circuits is the slight smoothing out action of the choke.

But let us continue to the left on the line just above L_1 and soon we come to the capacitor, C_{13}. This is the first of the main filter capacitors and reduces the ripples in the plate supply to the screen, suppressor and plate of tube, VT_2. This circuit is quickly traced through R_{16} and R_5. Still continuing to the left on the same line we come to the second main filter condenser, C_{11}, which means, therefore, that the plate supply to the first tube, VT_1, has the least ripple. This circuit is through the resistor, R_9. Screen potential is obtained through R_{10}. This completes the plate supply to the several tubes in the amplifier. In considering the filtering in a circuit it must always be borne in mind that resistors also reduce the ripple. Let us consider that ripple is an AC wave superimposed on a direct current. When this combined voltage passes through a resistor the voltage of the direct current and the AC current are both reduced. It is obvious that the supply on the output of the resistor will have a lower AC ripple than on the input. This factor is one of the considerations in the design of a filtering circuit.

The sound signal circuit is traced through VT_1 from the input in the regular way. But when we arrive at the grid of VT_2 we note that the grid resistor, R_7, returns to ground through R_6. Thus there is a voltage on the grid of this tube equal to the drop across R_6. But, since R_8 is in series with R_6 in the cathode circuit, the grid is always negative with respect to the cathode by the drop across R_8. Note also that, in addition to the drop through R_6 due to the combined plate and screen currents, there is also the effect of the modulation of the plate current by the signal current. That is we have a DC drop and an AC drop through this resistor. This AC will act to increase the voltage applied to the grid and since it is in phase with the signal it aids in improving the operation of the amplifier.

Push-Pull Obtained by Phase Inversion

A glance at the output transformer shows it to be of the push-pull type, but we do not find the push-pull tubes VT_3 and VT_4 coupled to VT_2 by a transformer. The coupling is by phase inversion. The direct sound circuit passes through VT_2 and the coupling capacitor, C_7, to the grid of VT_3. The grid of VT_4 is coupled

through C_5 to the upper end of R_8. It will be remembered that the plate current is modulated by the signal and that it flows through R_5 and R_6. These modulations are in phase with the signal and are impressed on the grid of VT_4 through C_8. Thus, since the output signal of a tube is 180° out of phase with the input signal, the signals on the grids of the two push-pull tubes are likewise 180° out of phase, which meets the requirement for pushpull operation.

One more factor, however, must be considered in the design of a circuit of this type and that is that the signal strength on the grids of both push-pull tubes must be the same. This is accomplished by proper selection of the cathode resistors with respect to the plate resistor, or plate load, and considering the characteristics of the tube employed. Note that the AC voltage applied to the grid of VT_4 is that across the two resistors R_8 and R_6. This voltage is equal to, but 180° out of phase with the AC voltage applied to the grid of VT_3 across R_4.

Inverse Feedback Circuit

Now follow the signal through the push-pull output transformer to the secondary terminal designated 24 ohms. There are three connections to this terminal, one is the output, the second goes to the jack, J_1, and the third to the inverse feedback and warping circuit. This latter circuit may be traced to the left and down to the cathode of VT_1. So a portion of the signal is returned to the cathode of the first tube, together with any noise or hum that may have been introduced into the amplifier from external sources or within the amplifier itself. Since this return signal is 180° out of phase with the signal on the grid of the first tube and is, likewise, out of phase with the modulations in the cathode circuit it will not reinforce the signal, but will cancel out a portion of the signal. Of course the feedback circuit is so designed that only a small percentage of the signal on the grid of the first tube is cancelled, just enough to obtain as quiet and distortionless an amplifier as desired. The gain of the amplifier is thereby reduced somewhat, but this factor is taken care of in the design. That is, the amplifier would be designed so that with say a 10% feedback it would meet the system requirements for gain.

If it is desired to feedback all frequencies, the amount of feedback is limited by a resistor in the feedback circuit. If, on the other hand, frequency selection is desired, then a resistor-capacitor mesh of the type shown in *Figure 1* is used. By adjusting the values of the components of this mesh many combinations of feedback frequencies may be passed or cut out. In this way, undesired pickup may be suppressed or the frequency response of the amplifier adjusted to conform to the acoustics of an auditorium. This latter statement should be qualified to point out that not all acoustical defects can be corrected by changing the frequency response of an amplifier. It is safe to state that sound can be improved in any auditorium by this means, but if the conditions are too extreme acoustical treatment will definitely be necessary.

The first mesh we come to in this circuit is composed of R_2 and C_6 in parallel with a removable strap across them. This combination is for low frequency equalization. With the strap removed, the higher the frequency the closer C_6 approaches a short circuit so that at the higher frequencies there is less and less selection of frequencies or loss through this combination. As the frequencies decrease, the value of this combination approaches the resistance of R_2 (100,000 ohms). Thus we find that, as the frequencies decrease, the amount of the signal fed back decreases and so the frequency response of the amplifier will rise at the low end. Actually a rise of 8.5 db at 55 cycles may be obtained. The constants have been selected so that the frequency response is not affected above 1000 cycles.

Continuing to the left from R_2 and C_6 we come to a more complex mesh, which

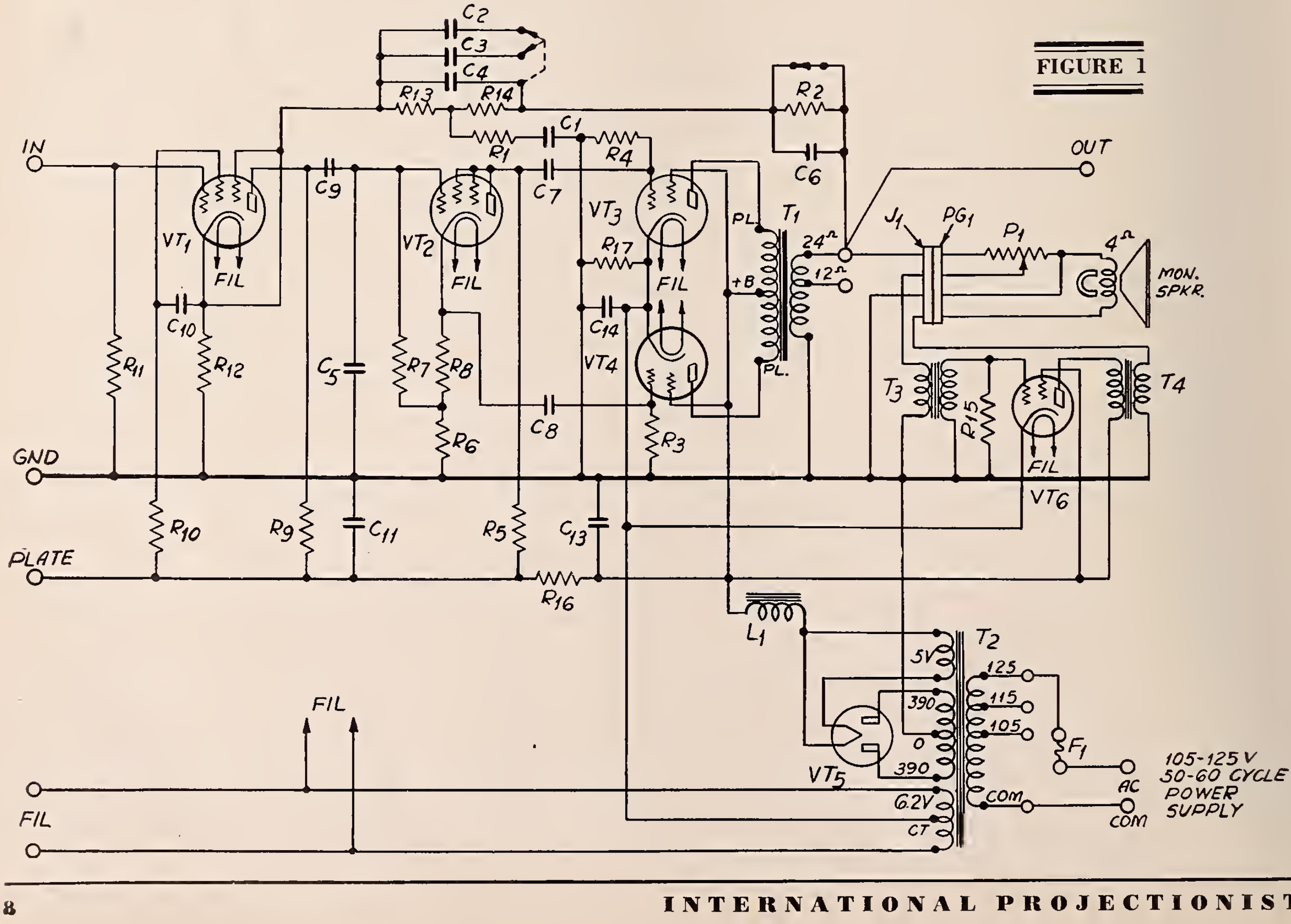

FIGURE 1

is adjustable for the control of the response above 1000 cycles. Disregarding capacitors, C_2, C_3 and C_4, for the moment let us see what will happen with the other components. The series resistors, R_{13} and R_{14}, may be said to present a constant impedance at all frequencies and therefore limit the amount of the signal that can be fed back, without frequency selection. The resistor, R_1, and capacitor, C_1, connected in series from the junction of R_{13} and R_{14} to ground, on the other hand do select frequencies. The higher the frequency the lower the impedance of C_1. Therefore, more high frequencies will pass through this circuit and by the same token it offers a high impedance path to the passage of low frequencies. This circuit by itself then will by-pass the higher frequencies from the cathode of VT_1 and so will tend to give a rising frequency response at the high end.

The addition of the capacitors, C_2, C_3 and C_4, however, changes the picture somewhat. C_4 is permanently connected across R_{13} and R_{14}, but the other two capacitors have an adjustable strap which permits connection and disconnection. As these two capacitors are progressively connected, the high frequencies more readily pass to the cathode and thereby the high frequency response of the amplifier is reduced. It can be readily seen that by selection of the components of this circuit a wide variety of frequency response curves may be obtained, within whatever limits are imposed by the usage of the amplifier. The particular components employed in this amplifier permit step-by-step variations on the low end from —1.2 to +8.5 db and on the high end from —9.8 to —19.8 db. With the equipment combinations currently supplied with sound systems and the desired accentuation of the low frequencies, it is necessary to raise the low end in most instances and lower the high end. High frequencies add brilliance and presence when not too predominant. If, however, the reproduction becomes "spitty," from too many highs, it is most annoying and disagreeable.

Monitor Amplifier Included

The inclusion of a separate monitor amplifier on the same chassis as the main amplifier and a monitor speaker in the same cabinet as the amplifier results in a compact unit that may be installed in the minimum amount of space. Thus, it is applicable to the smaller theatres where space may be at a premium. This monitor amplifier is of the typical single stage transformer coupled type. The resistor, R_{15}, across the secondary of the input transformer is provided to properly load it and at the same time it serves to improve the frequency response of the amplifier. An interesting feature of the unit is the plug-in arrangement for the speaker. This cord also includes the circuit for the monitor volume located adjacent to the speaker.

In presenting this modern amplifier it is interesting to note the differences as compared with the early types used in sound systems. The particular difference is in the method of obtaining frequency response equalization. In the first sound systems this feature was rarely included. Later, with the development of the two-way speaker system, and improvements in stage speakers, high and low pass filters or equalizers were introduced and were connected across the main sound circuit. These devices were of necessity larger in size and dissipated more power. Further they incorporated a very limited number of adjustments. This was necessarily so due to the fact that it was necessary to use reactances which do not readily lend themselves to flexibility in adjustment. With the advent of inverse feedback, however, the procedure of obtaining flexibility in adjustment was simplified, not only in regard to the types of components necessary, but in the physical size and configuration of the components. These components need not handle large amounts of power even in the large systems. Therefore they may be small in size—one watt resistors and small mica capacitors are plenty large enough.

Furthermore, the frequency response adjustment is obtained by cancellation of signal at low levels instead of by the introduction of losses at the desired frequencies after the signal has been amplified. Since the inverse feedback circuit functions to cancel unwanted signals, it follows that the output signal must be 180° out of phase with the signal on the tube to which the output signal is returned. It is common practice to return the signal to the first tube since here the signal has not been amplified. Therefore, unless special factors are introduced the amplifier has to have an odd number of stages.

MORE COPPER SCRAP NEEDED

With only one-fifth of copper scrap refining capacity operating there is urgent need for salvage of every ounce of the now precious metal, with the government's goal urging industry to produce 62½ per cent more than was gathered during 1942. This country depends upon scrap for approximately 40 per cent of its copper. The Salvage Division, War Production Board, wants all copper-bearing materials sent to it in order to achieve its goal of capacity operation of the nation's scrap copper refineries.

Television Seen as Post-War Entertainment Feature

THERE is no technical reason why motion picture houses cannot receive and project special television pictures on their screens after the war if such a procedure can be made economically sound and if managers can attract audiences to see the pictures, according to Dr. W. R. G. Baker, General Electric vice-president, in an address before the Schenectady, N. Y., Advertising Club.

He also declared that television has been responsible for much of our war success and that if it did nothing more before the war than train engineers in the art of high frequency work, it was well worth while. Television sets built after the war, it was pointed out, probably will produce pictures in black and white because color television may be too expensive and has not yet been worked out to the engineers' satisfaction.

However, Dr. Baker looks for color television some years after the war is over, as any immediate adoption of it would make obsolete much of the transmitting equipment of the country's eight television stations which will form the nucleus for immediate post-war broadcasting.

Previous to the war a sizeable portion of picture tubes—the most expensive part of television sets—were imported from Holland because they could be bought by U. S. manufacturers cheaper than they could be built here. It was emphasized by Dr. Baker that war has changed that and that when peace comes our manufacturers will have tremendous capacities to make these tubes here, with large-scale production and other developments reducing costs.

The speaker brought out that post-war relaying of programs will be done with coaxial cables or television relay stations, or possibly a combination of both, and only developments will tell who will operate these relay links. General Electric has had a relay station in operation for over three years, located outside Albany, N. Y., which picks up programs from the NBC television station in New York and relays them to the Albany-Schenectady-Troy area through G. E.'s WRGB transmitter.

Television essentially is a line-of-sight operation from transmitter to receiver stations, Dr. Baker concluded, and therefore probably will be located in the larger cities with transmitters located where they can reach the most receivers. After the address the audience was shown a movie on television, "Sightseeing at Home," and later toured the G. E. television station where they saw two "live" productions being televised.

I. P. Contestants Tackle Crackling And Popping Noises in Sound Systems

THE March Contest Question, "How would you clear a loud crackling or popping noise in your sound system?" was intended to direct the thinking of the projectionist toward one of the more obscure but common troubles in sound systems. These noises have caused many a "headache" in many systems. Sometimes they are intermittent, in fact they do not continue for a long enough period of time for any real diagnostic tests to be made. Sometimes nothing can be done to the system to bring about the recurrence of the disease as long as the "doctor" is about. But let him just turn his back for an instant and there it is again just like the will-o'-the-wisp and just as elusive.

In other instances a quick, careful analysis of the tvpe of noise will give a very definite indication as to the source of the trouble, or maybe we should say sources, as the same type of crackling may well be caused by more than one defective component. We hope that we have started all projectionists to think just how they would analyze such a condition and solve the trouble.

Noise of this type may originate outside the sound system or, as noted above, may be due to some defective part in the sound system itself. In some instances it may occur only at certain times during the day. In other instances it occurs at irregular intervals apparently for no good reason. Therefore, the first decision to be made is, is it originating inside or outside the system, and then prove it. We find many sources of trouble outside the system; such as motors, rectifiers, fans, neon and flashing signs, violet ray and electro-therapy machines, electric razors and hair clippers, the old spark transmitters and numerous other similar electrical devices.

A good knowledge of such equipment in the theatre and in nearby stores, offices and apartments will be exceedingly helpful. These interferences may be picked up in any part of the system including a stage run that is not in metallic conduit or even in the tirex cables that are often used between the junction box on the stage and the stage speakers. Usually, however, such disturbances are not likely to be high enough in level to be audible without amplification. Therefore, such pickup occurs most commonly in the voltage amplifier although the main amplifier may be suspected. To make the situation more complicated the noise may be introduced by way of the AC power lines.

No Set Rules

There seems to be no set rule for determining whether the noise is internal or external; hence the above notes relative to the helpfulness of a good knowledge of the electrical equipment nearby. If such noise occurred just after the installation of a new piece of equipment one immediately has a pretty good clue. As far as the electrical equipment in the theatre goes, disconnecting or stopping each unit progressively will eliminate it or prove it to be the source. From then on the work on the system begins and it should be done systematically and logically so that the show may go on as quickly as possible.

Just how do we go about tracking down the source of noise in a sound system? Each type of system seems to have its own little idiosyncrasies, so the steps cannot be tabulated for a general procedure. However, there are certain general principles that may be applied to systems in general. If the noise occurs in only one sound head, the source should logically be in that sound head or in its associated voltage amplifier. If the noise ceases when the first tube in the voltage amplifier is removed or the input to the voltage amplifier is shorted we would look for the trouble in the sound head. On the other hand we would search for the trouble in the voltage amplifier if the noise stopped when the first tube in the power amplifier was removed or its input shorted. Before shorting inputs be sure that no plate voltage is being carried in that line. In some of the modern systems, using high impedance coupling, the blocking capacitor is in the input circuit of the amplifier rather than in the output and therefore the input line is hot.

Noise in both machines immediately indicates that the trouble is beyond the output of the voltage amplifiers. But be careful on this one. If the plate supplies are common at the voltage amplifiers, trouble in one of the plate supply circuits may reflect back to the other amplifier and it may not be possible to isolate these circuits by throwing any switches that may be provided. Disconnection of the proper leads must be resorted to. In case a fader is in between the voltage and power amplifiers, this unit should be carefully investigated for possible troubles. From here on we have possibilities of trouble in the power amplifier, network, stage line and speakers, and of course the exciter lamp and speaker field power supplies.

Shorting the output of the power amplifier will indicate whether this unit is the source of the trouble. Networks seldom are the cause of crackling or popping noise so we might check the stage line by shorting the network output. From here we go to a check of the stage speaker field supply; that is, if Old Man Trouble has not already been caught up with. Both the stage speaker field and the exciter lamp power units are much more frequently the source of hum than of this type of noise and it is for that reason that we have mentioned them last. However, if the cause has not yet been determined not one unit in the system can be overlooked as a possibility. Experience records of service bring to light new and obscure causes of trouble and just because an individual has not encountered certain conditions does not mean that it cannot exist. An open mind, which examines and analyzes every possibility and then proceeds logically is very necessary in all service work.

Study Trouble Sources

With these hints let us see how the projectionists, the men who have to live with these potentialities, plan to attack a problem of this nature. The contestants have, of course, applied their procedure to their own system and as indicated above this cannot be construed to be a general procedure for any system. It is true that many of the procedures may be applied to all systems, others to a large group of systems, while some only to one type of system. Why not study these proposals, plan how they may be adapted to your system and be prepared to go after such a condition, cure it and have the show on again in no time at all?

Russell A. Schrempp, the first prize winner, has presented a very detailed procedure as applied to his Western Electric System, using a 209A Reproducer Set. The following is on the assumption that the noise starts during a show. He lists them in the order given, but writes that the exact order of the tests

would depend upon the projectionists' judgment due to past experience with the equipment.

1. Check the 91A amplifier meter readings. An abnormal reading means trouble in the tube, its circuit or power supply.

2. Check the volume control or fader for poor contact or dirty points; also the sound changeover switch points.

3. Examine sound aperture and lens for obstructions in the light beam.

4. Inspect the sound track if it is the first showing of a subject or print.

5. Wriggle the plug-in type "Input," "Output," and "AC" plugs for poor contact at the prongs; also the plug-ins on the rectifier unit as well as the amplifier.

6. Snap "On-Off" switch on the amplifier as a test for a poor contact. This trouble has been experienced before.

7. Check grid cap contacts on 301B tubes.

8. Wriggle all tubes up and down in their sockets for possible intermittent contact at the prongs.

9. Inspect all soldered connections on the 100A and 101A Connector Units; also the monitor speaker connections.

10. Examine the sound system water pipe ground connection for cleanliness and rigidity. Incidentally, this point should be inspected and cleaned from oxidation at least once a year.

He would next carefully inspect and test all electrical components of the reproducer set. Likewise the network components and the stage speakers would be carefully gone over, thus leaving only the 91A Amplifier. Mr. Schrempp points out that amplifier servicing is best done under operative conditions. Partial or intermittent open circuits or grounds in resistors, capacitors, transformers, etc., may exist only under operating voltages and currents and may not be detectable by volt-ohmmeter systems of testing. He uses the substitution method on that account, wherever practical. All tubes are to be replaced with checked new ones before proceeding to test the various components of the amplifier. He points out that just because a tube is taken from a sealed carton does not mean that it is perfect. Tube elements are easily damaged in shipment. All soldered joints are inspected, all tube sockets cleaned and tightened and all plugs and receptacles similarly gone over. All ground circuits, especially those of the electrolytic capacitors to the chassis, are inspected and examined for corrosion.

Grid, plate, voltage divider and bias resistors are tested by the substitution method. Each electrolytic capacitor is checked by disconnecting it from the circuit. If the crackling continues, the unit is not at fault. This statement is qualified when such a removal renders the amplifier inoperative. In such a case the substitution method is employed. Interstage, paper wound, coupling capicitors and similar capacitors in the inverse feedback circuit can be tested with an ohmmeter or neon tube condenser leakage tester, but here again the substitution method is better. And so Mr. Schrempp goes through careful tests on the various transformers and concludes by stating that the projection room power line, its switches, fuse blocks, etc., should be inspected for loose connections and oxidized contacts.

George J. Beltz, the second prize winner, writes that the first unit to check is the amplifier for loose parts and surface defects by moving tubes in sockets and pulling at wires to see if the crackling noise increases. He points out that any electrical component that has a poor connection and is subject to vibration can be a source of intermittent noise. If trouble cannot be located by the above, earphones can be used for an isolation test in each stage from grid to ground or chassis, starting with the output and working toward the input. He lists the following causes:

Loose or corroded connections in AC feeder lines to Amplifier.

Loose or corroded spring contacts or defective fuses in AC line or amplifier circuit.

Loose, poorly soldered, corroded or rosin connections on the following:

Ground connections of amplifier.

Prongs or contacts on rectifier or amplifier tubes.

Control grid caps.

Resistors, capacitors, grid leaks, choke coils, variable resistors, faders and potentiometer volume controls.

All high resistance joints.

Dirty sockets, causing prongs to make poor contact.

Green discoloration on connections or joints is a definite sign of corrosion and indication of possible source of noise.

REMEDY: Clean contacts, tighten and resolder connections as required.

Noisy or defective tube.

Tube loose in socket.

Broken elements inside tube.

Volume control in gassy tube circuit.

Exciter lamp filament loose or broken, but making intermittent contact due to vibration. Noisy P. E. Cell.

REMEDY: Replace tube or exciter lamp or P. E. Cell.

Noisy filter capacitor or leaky fixed capacitor.

Noisy resistor, grid leak.

Defective rectifier socket — broken and causing leakage.

REMEDY: Replace with good part.

Punctured insulation of high voltage wire near low voltage wire especially where possible dampness exists.

REMEDY: Separate wires and dry out, also tape punctured insulation.

Partially shorted circuits.

Terminal strip carbonized causing leakage.

Poor insulation in power transformer causing flash over.

REMEDY: Clear trouble and insulate part.

(Continued on page 26)

Army-Navy "E" flag awarded to DeVry for excellence in production of motion picture sound equipment. Above (left to right): William C. DeVry, president of DeVry Corp., who accepted the flag on behalf of his fellow workers; John Laug, pioneer DeVry craftsman; Lt. Col. Gerald H. Reynalds who presented "E" pins to veteran DeVry employees, and Capt. Frank Loftin, U. S. Navy, who made the flag presentation.

Underwriters Code As It Affects Projection Rooms

Every projectionist knows that his equipment and operations, and any changes he may make in his equipment, must meet the Fire Underwriters' requirements. How many projectionists know what those requirements are in detail? IP will reprint from time to time portions of the National Electrical Code that are important to the projection room, and amendments to the Code as they are issued. Herewith is presented the seventh installment, with some of the definitions and wiring rules that will be needed for understanding subsequent installments. IP welcomes inquiries on practical application of the Code to projection room problems.

VII

2205. *Common Neutral Feeder.* A common neutral feeder may be employed for two or three sets of 3-wire feeders, or two sets of 4-wire or 5-wire feeders. When in metal enclosures, all conductors of feeder circuits employing a common neutral feeder shall be contained within the same enclosure as provided in section 3052.

2206. *Diagram of Feeders.* If required by the authority enforcing this code, a diagram showing feeder details shall be supplied previous to installation. This diagram should show: Area in square feet; load (before applying demand-factors); demand-factors selected; computed load (after applying demand-factors); and the size of conductors.

All devices for recording sound on steel wire or tape operate by drawing the wire between the poles of an electro-magnet actuated by sound current. The extent of magnetization imposed on that section of the wire which is passing through the magnet at a given moment is proportional to the strength of the sound current actuating the magnet at that moment.

The voltage ratings desired, as well as the capacitance, must always be taken into account when replacements are ordered or when a condenser is taken from the spare parts stock to be installed at any point for which it has not been specifically recommended.

Available for some civilian purposes is iron in cast, malleable or pig form, beryllium-copper, silver and mercury, among other metals; as well as glycol and chlorine among chemicals. Available for civilian use in large quantities are lead, carbon, rosin, glass, mica, sulphur. Restrictions previously imposed on sulphur, as well as on waste paper, caustic soda and a number of other materials, are now withdrawn.

d. Motor Load. The load for motors shall be computed according to the provisions of sections 4314 and 4316.

e. Neutral Feeder Load. The neutral feeder load shall be subject to the provisions of section 2204.

2403. *Carrying Capacity.* Conductors shall be protected in accordance with the carrying capacities of Tables 1 and 2, Chapter 10,[1] except as follows:

a. If the allowable current carrying capacity of the conductor does not correspond to the standard sizes or ratings of overcurrent devices, the next larger size or rating may be used, but not exceeding 150 per cent of the allowable current carrying capacity of the conductor.

b. Fixture Wires and Cords. Fixture wire or flexible cord, sizes No. 16 or No. 18, and tinsel cord shall be considered as protected by 15-ampere overcurrent devices. Flexible cord No. 18 or larger, approved for use with specific appliances which may be used on the 15-, 20- or 25-ampere circuits described in Article 210, shall be considered as protected by the overcurrent protection of such circuits.

2584. *Resistance.* Buried or driven electrodes shall, if practicable, have a resistance to ground not to exceed 25 ohms. If the resistance is not as low as 25 ohms, two or more electrodes connected in parallel shall be used.

Continuous metallic underground water or gas piping systems in general have a resistance to ground of less than 3 ohms. Metal frames of buildings and local metallic underground piping systems, metal well casings, and the like, have, in general, a resistance substantially below 25 ohms. It is recommended that in locations where it is necessary to use buried or driven electrodes for grounding interior wiring systems, additional grounds, such as connections to a system ground conductor, be placed on the distribution circuit. It is also recommended that single electrode grounds when installed, and periodically afterwards, be tested for resistance.

2586. *Use of Lightning Rods.* Lightning rod conductors and driven pipes, rods or other artificial electrodes used for grounding lightning rods, shall not be used for grounding wiring systems, equipment and the like.

Grounding Conductors

2591. *Material.* The material for the grounding conductors shall be as follows:

a. For System or Common Grounding Conductor. The grounding conductor of a wiring system shall be of copper or other corrosion-resistant material. The conductor may be solid or stranded, insulated or bare. Except in cases of bus-bars, the grounding conductor shall be without joint or splice throughout its length. If the grounding conductor is not of copper, its electrical resistance per linear foot shall not exceed, and its tensile strength shall not be less than that of the allowable copper conductor for such a purpose.

b. For Conductor Enclosures and Equipment Only. The grounding con-

(*Continued on page* 23)

[1] To be printed in a subsequent installment.—Ed.

National Theatre Supply Company Merges Bludworth

W. E. Green, president of National Theatre Supply Co., with headquarters in New York, announced that Bludworth, Inc., New York, makers of precision instruments and special sound devices, has been merged with National. He also said that the addition of Bludworth to the company's line will greatly increase the scope of National's business.

George Friedl, former president of Bludworth, Inc., and long active in the S. M. P. E., has been elected a vice-president of National-Simplex-Bludworth, Inc., under which corporate title operations of the combined organizations will be carried out.

"In this expansion of National's development in the theatre equipment and allied fields," asserted Mr. Green, "the 16-year-old equipment organization will, in the future, utilize the full title of National Theatre Supply Division of National-Simplex-Bludworth, Inc.

"This is the only change, so far as National Theatre Supply is concerned. As a natural complement to the business carried on by National Theatre Supply Company," stated Mr. Green, "Bludworth adds a smooth functioning group of installation and service engineers on mechanical and electronic marine instruments." He also emphasized that there has been no other change in the executive management of National or in its 28 branches throughout the country.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random; fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Cleaning and Polishing Drive Motor Armature Shaft

Before replacing oil seal washers, I usually polish the shaft by placing the rotor against a film-rewind belt, holding both ends of the shaft in my hands and using a crocus cloth as a polishing medium. This is a crude substitute for a lathe, but has proven satisfactory for field use.—R. H. Bisbee, *RCA.*

Emergency Operation of Exciter Lamp Power Units

In exciter lamp power units using a 90-ohm resistor for adjusting the voltage, I have found that installing an old resistor with leads and small battery clips attached, so that it can be clipped across a defective unit in an emergency. is excellent assurance against exciter lamp outages and gives the projectionist a feeling of security.—A. H. Ciow, *RCA.*

Setting Shutters on Projectors

A simple gadget helps setting shutters, especially the rear shutters on Simplex projectors. This is a small pointer made to encircle the rear bearing of a double-bearing movement. The pointer points to a tooth on the intermittent sprocket when not in cycle. In cycle the sprocket is turned so two and one-half teeth pass the pointer. Any type shutter blade is then set with the master blade squarely across the lens or aperture.—Larry Glennon, *Landers Theatre, Springfield, Mo., and* A. F. Schnieder, *RCA.*

Conservation of Carbons and Electricity

Projectionists could get much better results in the conservation of carbons and electricity if they would make it a practice to clean the condensing systems every day, and by careful trimming of the shutter blade.—H. Prosser, *RCA.*

Improving Operation of Power Units

Tungar bulb rectifier sockets in power units should be periodically checked for loose internal contacts. Since the center contact of these sockets is more or less rigid, the threaded portion of the contact is apt to be strained, thereby creating a tendency to loosen the screws holding them. This, in turn, is usually responsible for the failure of the tungar bulbs to light up when turned on before show time. In some instances, the center contact becomes loose thereby bringing about the possibility of a short circuit between center and screw contacts.

After removing the socket, it is necessary to dig out the compound in order to tighten up the screws. As stated previously, the center contact being rigid, screwing the tungar in the socket too tightly will sometime cause undue strain on the outer threaded contact. Therefore, if the tungar bulb is inserted just to a point of filament contact there will be less danger of loosening of screws.—H. E. Frisbie, *RCA.*

Relay Dust Cover

In theatres where trouble with change-over relay contacts was due to dust and dirt, I made covers for the relays from clear cellophane and fastened them on with Scotch tape. These covers not only keep dust and dirt from collecting on the contacts, but being transparent, afford observation and are easily removed for cleaning.—G. E. Reiger, *RCA.*

Patching Film

I have been told by a number of projectionists that in order to make a film patch hold on the present war stock film, it is necessary to scrape *both* sides of the film in making their patches. Otherwise, the joint or patch will open up in a few days.—M. Levy, *RCA.*

Stroboscope for Determining Speed of Projectors

It is sometimes desirable to accurately determine the film speed of a projector in order to predetermine the running time of a show in making up schedules. This can be done more accurately with materials usually available in the theatre than with the use of expensive instruments, including most electrical tachometers.

With the aid of a compass, lay out a circle about two inches in diameter on a piece of heavy white cardboard. Divide this circle into ten equal parts. This may be done by adjusting the compass or divider points to a distance you judge to be one-tenth the circumference of the circle. Try this by stepping off with the compass around the circumference of the circle. If it does not come out an even ten steps around to the starting point, readjust the compass until it comes out just right. Draw lines from these points to the center, thus forming the ten sections of the stroboscope, and fill in every other section with black ink. Make a hole in the center slightly smaller than the flywheel shaft or shutter shaft, and cut the disc from the cardboard.

Place this disc on the shutter shaft or flywheel shaft, and operate the projector under normal conditions. With a sixty-cycle a.c. lamp (neon is best) showing on the disc, it will appear to stand still if the speed is exactly ninety feet per minute (film speed). If it is more, the disc will appear to revolve forward (direction of rotation of shaft upon which it is placed). If the speed is lower, it will appear to revolve backward. To determine the speed above or below ninety feet per minute, as the case may be, count the number of times the disc appears to revolve during an accurately timed minute.

The number of complete revolutions it appears to make is the number of frames of film above or below ninety feet per minute, depending upon the direction of apparent rotation. Converting frames to feet on the basis of sixteen frames per foot, the film speed may be determined to an accuracy of at least one-sixteenth foot per minute if timing has been accurate. If the a.c. supply is fifty cycles per second, it will be necessary to make the disc with fifty sections, alternately black and white.—C. D. Welch, *RCA.*

Focusing W. E. 209-211 Opticals

To avoid focusing W. E. 209-211 Opticals on half of test film frequency, I use a piece of 7,000-cycle film wrapped about the drum as ERPI notes specify use of black leader. A piece of white paper is placed over the prism. The optical is then adjusted in a manner similar to flicker check as used with any other optical system. First, an approximate adjustment of azimuth is obtained, as indicated by sharp black lines on paper

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In The

SPOTLIGHT

By *HARRY SHERMAN*

MOTION picture theatre owners throughout the country have been warned by the Service Equipment Division of the War Production Board to exercise every possible precaution against potential fire hazards in their theatres. It was reported that forty-three fires during the last four months either damaged or destroyed motion picture theatres, as compared with ten for the previous four months. This merely strengthens our firm conviction that the fire hazard in motion picture theatres could be considerably reduced by the use of adequate manpower in the projection room.

It is a short-sighted policy that prompts the exhibitor to effect a policy of economy by cutting down his projection room personnel. With one man in a projection room to run the show and to attend to his other duties which would necessitate his leaving the running projector, even if only for a few moments, the exhibitor shows very little regard for the safety of his patrons, his employees, and for his property.

One man in constant attendance upon the running projector, while the second man takes care of the film rewinding and other projection room duties, would cut down, if not eliminate, the fire hazard. Unfortunately, this is a language not understood by the majority of motion picture theatre exhibitors—they are too much concerned with box-office receipts and reduction of manpower in their theatres to take too much interest in the safeguarding of human lives.

● The death of Joseph Dean, former secretary-treasurer of Local 171, Pittsburgh, Penna., was reported to I. P. by Luther Thompson, the present local secretary. Dean was formerly employed at the Liberty Theatre in Pittsburgh, and was one of the older members of the local.

● A canteen party to about 400 members of Uncle Sam's armed forces was recently given by Local 199, Detroit, Mich. We were informed that the party was a tremendous success and that many of Detroit's prettiest girls acted as hostesses. Roger Kennedy, business agent of 171 and an I. A. vice-president, Roy Ruben, secretary-treasurer, and Houston S. Morton of Local 199, were chiefly responsible for the success of the event.

● Although wages have been frozen by Presidential order, film rentals and theatre admission prices still run merrily upward. What fun, these days, counting box-office receipts!

● Louis Goldschlag, who had been ailing for quite some time, is now well on the road to recovery. Lou, formerly secretary of Local 366 and steward for Local 650, both of Westchester County, N. Y., expects to be back on the job very soon.

● This is indeed a strange world. Many people, so-called "personal friends," are waiting with unconcealed glee for certain indictments to be made. It should be remembered that an indictment is not a conviction of an offense, as has been proven time and time again. Not so long ago, a man was convicted and found guilty of assaulting a woman, a crime punishable by a 10-20 year prison sentence. When the convicted man was brought before the judge for sentence, another man was produced who confessed to the crime. There are many instances in court history where indictments were found to be unjust and unwarranted. (Read "*Convicting the Innocent*.")

● We are watching with keen interest the wage negotiations now in progress between Local 173, Toronto, Canada, and the exhibitors in that city. The union officials are asking for a wage increase of only $3 per week for each member—a modest demand these days of soaring living costs.

● Just a few random notes on the activities of Local 279, Houston, Texas, members. · Jimmy Webb, well-known in the sporting world as a former contender for the ring's light heavyweight championship, is now Private Webb of Fort Sam Houston, San Antonio, Texas, where he is training for the greatest bout of all times—*Freedom* versus *Slavery*. . . . Sgt. Cecil Stein is the undefeated champion pool and billiard player in Houston. He attributes his great skill with the cues to the expert guidance of Jess Hogue, plus his weekly training on that great delicacy of all delicacies—*gefuelte fish*. . . . W. J. Hamilton, projectionist at the Ritz Theatre in Houston, boasts of a 27-year membership in the I. A. Ham is very proud of his two soldier sons—W. F., who is chief projectionist at Strother Field in Kansas, and R. J., chief projectionist at Keesler Field, Miss. We suggest, however, that he brush up a bit on his poker playing—he is a bad poker player but a swell loser.

● After a decade of bickering and wrangling between New York City Local 306 and the Empire State Union, the amalgamation of the two rival projectionist unions in Greater New York is now in sight. At a special meeting called by Local 306, an overwhelming majority of the membership voted in favor of the merger.

The Empire State Union has for many years been a thorn in the side of Local 306, and as far back as ten years ago it was proposed that Local 306 absorb the Empire State membership thus removing a whip the anti-306 exhibitors held over the heads of the I. A. union officials. These exhibitors objected so strenuously to the suggested merger that they obtained an injunction restraining the then pending amalgamation from being consummated. The reason for their concern was obvious—they preferred the existence of two rival projectionist unions so that they might continue to play one union against the other in wage scale negotiations. However, now that the Empire membership of 234 men will be given full membership in Local 306, we can look forward to the day when all motion picture projectionists in Greater New York will be full-fledged I. A. members and fighting for a common cause.

I. A. President Walsh, Father Boland,

and License Commissioner Moss played prominent parts in the negotiations between the two unions. The Empire State Union was represented by Abraham Kindler, president; Nick Pitta, vice-president; and Wm. Santorsiro, secretary. Representing Local 306 were Herman Gelber, president; Herman Boritz, acting vice-president; Morris Kravitz and Jack Teitler, business agents; Charles Beckman, financial secretary; Nathaniel Doragoff, recording secretary; James Ambrosio, treasurer; Ernest Lang and Edgar T. Stewart, executive board members, and Ben Scher.

● When Stanley Creech, member of Vancover Local 348 and an officer in the Canadian Navy, visited these offices on his last furlough, he left his official I. A. service card with the writer. This card, endorsed by I. A. officers Walsh, Krouse, Brennan, and Basson is safely tucked away in a secret compartment of our desk and will be delivered to Stan on his next visit here.

● Charlie LeRoy Borgeson, affectionately called "The Smiling Swede" by all his friends, has returned to work at the Tower Theatre, Dallas, Texas, after being incapacitated for almost four months with a broken leg. Charlie is extremely proud of his two soldier sons —Capt. Charles, Jr., and Lt. Roger, both in the Army Air Corps.

● The film exchange employees of Omaha, Nebraska, recently won a wage increase of $3 per week, retroactive for ten weeks, largely through the efforts of Clyde Cooley, secretary of Omaha Projectionists Local No. 343, who conducted the negotiations for them. Good going, Clyde.

● We found the crocodile tears shed by the various companies anent the huge government taxes they have to pay too, too touching. So, after a painstaking bit of research work we made the following discovery: In the year 1941, after paying government taxes totalling to $13,725,358, the following companies reported a combined profit of $34,963,129: Columbia, Paramount, MGM, 20th-Century, Universal and Warner Brothers. For the year 1942, after payment to the government of taxes totalling $38,060,793, these same companies reported a combined profit of $50,392,008! Enough to keep a flock of wolves away from the door, we say.

● My, my, how time does fly! We remember Eddie Miller, Local 279, Houston, Texas, business agent and I. A. representative, as a gay young blade. It looks very much as though Eddie had better put in his bid for a nice comfortable chair by the fireside where he could spend the rest of his days reminiscing about the glories of his youth. What brought all this about? Well, Eddie's daughter, Nan Gray, the famous movie and radio star ("Those We Love") recently became the mother of a baby girl, thereby making him eligible for membership in the A. K. Club.

● DeWitt Bittenbender, president of Local 224, Washington, D. C., is pinch-hitting for Tom Reed, ailing business agent of the local. We know Reed to be a tireless worker, and hope to see him up and around very soon.

● Twenty-two state legislatures have adjourned without taking the trouble to put through a bill to protect the lives of the theatre-going public against catastrophes such as may occur in places of public assembly. Yes, many bills pertaining to the theatre were argued while the legislatures were in session—whether to have free or pay toilets, bingo games, seats for tired doormen, etc.—but not one bill was passed making it mandatory to have a two-man shift in the projection room. Guess the State of Massachusetts, one of the pioneers in the enactment of the two-man per shift law, has good reason to be proud of its union officials.

● Another of our good friends has passed on. Shep Owen, vice-president of L. 343, Omaha, Neb., died recently and was succeeded in office by Ben Cuttle, projectionist at the Circle Theatre.

● To the best of our knowledge, John J. Friedl, Chairman of the War Activities Committee in Minneapolis, Minn., is the only motion picture theatre exhibitor who has publicly acknowledged the excellent cooperation extended by the various I. A. local unions in his territory in the copper salvage drive. Over 190 tons of copper have been salvaged in his district, due in no small measure to the support given the drive by the craft. "Particularly gratifying to me," stated Mr. Friedl, "was the manner in which organized labor gave its wholehearted support to the drive, among them, the booth operators." Thank you, John, in behalf of the craft.

● While touring through Texas recently, we ran into an old friend—Lew Burke, vice-president of the I. A. way back in 1912. Lew is now working as stage manager of the Worth Theatre, in Fort Worth, Texas, and is just as spry and chipper as a man half his age.

● Have you noticed all the publicity given to the theatre managers working on the recent Red Cross drive? Newspapers and exhibitor publications played up these "managerial wonders" by publishing their pictures and praising them in their editorial columns for their unselfish work in behalf of this worthy cause. Not one line, however, was written in praise of the man working in the projection room, who helped put this drive over by donating his services in addition to cash contributions.

● Quite a bit of interesting, and very often humorous, correspondence has passed between this department and Ed-

(*Continued on page* 18)

UNITED STATES TREASURY DEPARTMENT

For distinguished services rendered in behalf of the War Savings Program this citation is awarded to

International Projectionist

Given under my hand and seal on January 30 1943

Henry Morgenthau Jr.
SECRETARY OF THE TREASURY

Revised Projection Room Plans

A REPORT OF THE PROJECTION PRACTICE COMMITTEE OF THE S.M.P.E. †

The projection room plans detailed in the accompanying article constitute the third revision of the original plans published by the Committee in August 1932. The two prior revisions were made in October 1935, and November 1938. Such revisions are necessary from time to time in order to keep pace with the changes and developments in the art and practice of projecting sound motion pictures, and to assure that the projection room is so planned that it will permit maximum efficiency of operation of the equipment installed within it.

THE Projection Practice Committee urgently recommends the adoption of the following recommendations by all architects and builders in designing and remodeling projection rooms so that greater uniformity of construction and greater efficiency in projection will exist in the future.

In following these recommendations, proper authorities should in all cases be consulted for possible deviations therefrom as may be required for conformance to local rulings. All fire-protection requirements specified or referred to herein are in accordance with the National Board of Fire Underwriters and the National Electric code, which should be consulted for details.

Projection space facilities shall consist of (1) the projection room proper, (2) film rewind and storage space, (3) a power equipment room, and (4) a lavatory.

Projection Room Proper

(1.1) *Construction.*—The projection room shall be of fire-resistant construction throughout and shall be supported by or hung from fire-resistant supports. The projection room shall have a minimum height of 8 feet. The width and depth of the projection room shall be governed by the quantity and kind of equipment to be installed within it, and also whether the film-rewinding and film-storage facilities are to be incorporated in a separate room or be a part of the projection room proper.

The minimum width of the projection room, for one projector, when film-rewinding facilities are provided for in a separate room, shall be not less than 8 feet. For each additional projector, spotlight, stereopticon, or floodlight machine shall be added an additional 6 feet in width. The minimum depth of the projection room, when film-rewind and storage facilities are provided for in a separate room, shall not be less than 10 feet (Figure 1).

When film-rewinding and storage facilities are incorporated within the projection room proper, which may be desirable under some conditions, the minimum width of the projection room when the film-rewinding and storage facilities are placed in line with the projectors, shall be not less than 16 feet for one projector. For each additional projector, spotlight, stereopticon, or floodlight machine, an additional 6 feet in width shall be added. When film-rewinding and storage facilities are within the projection room proper and placed in line with the projectors, the minimum depth of the projection room shall not be less than 10 feet (Figure 2).

When film-rewinding and storage facilities are incorporated within the projection room proper and are located to the rear of the projectors, the minimum width of the projection room for one projector shall be not less than 8 feet. For each additional projector, spotlight, or floodlight machine, an additional 6 feet in width shall be added. When film-rewinding and storage facilities are incorporated in the projection room proper, and placed at the rear of the projectors, the minimum depth of the projection room shall be not less than 12 feet (Figure 3).

Great care should be exercised in

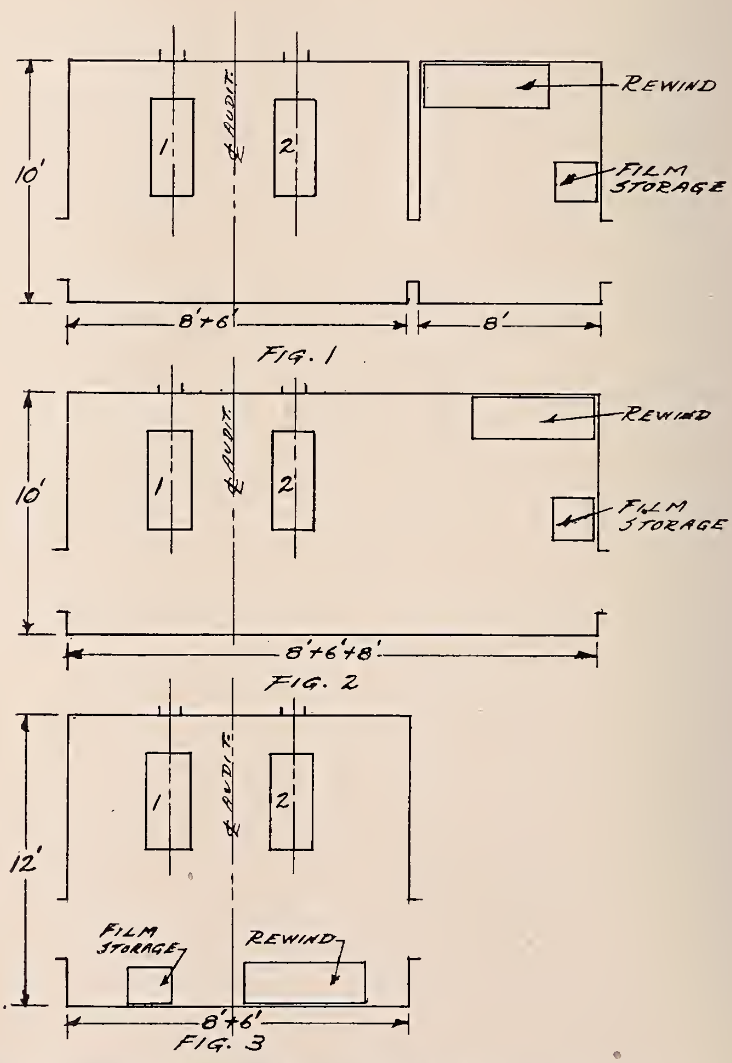


FIGURE 1 *(Upper). Layout with separate rewind room.*
FIGURE 2 *(Center). Layout with rewind bench and storage cabinet at end of room.*
FIGURE 3 *(Lower). Layout with rewind bench and storage cabinet behind projectors.*

† *J. Soc. Mot. Pic. Eng., Sept.* 1942

selecting the film-rewinding and storage facilities layout that will be most efficient for each particular theatre. Efficient operation requires that the screw shall be in view of at least one member of the working projection room staff whenever a picture is being projected to the screen.

Generous consideration should be given to all probable future needs for additional projection room space.

The projection room proper shall be so located with respect to the screen that the vertical projection angle shall not exceed 14 degrees. Since the ideal projection angle is one of zero degrees, it is recommended that every consideration be given to keep the projection angle at as near the ideal as possible. Optical axes of the projectors shall be five feet apart.

When two projectors are used, the optical axes shall be equidistant from the centerline of the auditorium; when three projectors are used, the optical axis of the center projector shall be on the centerline of the auditorium. Motion picture projectors shall be given preference over stereopticons, spotlights, or floodlight machines, for installation nearest the centerline of the auditorium.

(1.2) *Floor.*—The floor of the projection room shall be sufficiently strong and solid for the load it is to bear. A minimum strength of floor construction of 200 pounds per square-foot plus the dead weight of the construction proper is recommended. A generous factor of safety should be allowed. A type of floor construction recommended consists of (1) a reinforced concrete floor-slab not less than 4 inches thick, (2) a tamped cinder fill above the floor-slab not less than 4 inches thick, and (3) a troweled cement finish above the cinder fill, not less than 2 inches thick.

Items (2) and (3) have been provided in order to accommodate concealed electric conduits, which should be installed prior to placing the fill and finish. The cinder fill of the projection room floor may be eliminated where there is a plenum space beneath the projection room area proper, and which area is available for the running of conduit.

(1.3) *Walls and Ceiling.*—The projection room walls shall be built of brick, tile, or plaster blocks plastered on the inside with ¾-inch cement or acoustical plaster, or all concrete. The core of the wall shall be not less than 4 inches thick. When plaster block is used, it shall be supported upon steel framework. All electrical conduits shall be in masonry chases in the wall construction so that they shall not project beyond the finished plaster line (*see Sec. 6.1*).

In all cases, the inside surface of the front wall shall be smooth and without structural projections. The ceiling shall be constructed of 4-inch concrete slabs or pre-cast concrete, or of 3-inch plaster blocks supported by a steel structure and plastered on the inside with ¾-inch cement plaster or acoustical plaster. All electrical conduits in the ceiling shall be concealed (*see Sec. 1.10*).

(1.4) *Doors.*—A door shall be provided at each end of the projection room. Doors shall be not less than 2 feet 6 inches wide and shall be 6 feet 8 inches high. Doors shall be approved fire-doors of a type suitable for use in corridor and room partitions (Class *C* openings, as defined in the *Regulations for Protection of Openings in Walls and Partitions*), shall be self-closing, swinging outwardly, and shall be kept closed at all times when not used for egress or ingress. It shall be possible at all times to open either door from the inside merely by pushing it. Door jambs shall be made of steel.

(1.5) *Windows.*—Where a projection room is built against the exterior wall of a structure, one or more windows may be provided in the wall. Window construction shall be entirely of steel, and the glass shall be of the shatter-proof type. Adjustable metal louvres or equal means shall be used to exclude direct light. Extreme caution should be taken to prevent dirt and dust from entering the projection room area through windows opening directly to the outdoors.

(1.6) *Portholes (General).* — Two portholes shall be provided for each projector, one through which the picture is projected, known as the "projection port" (*see Sec. 1.7*), and the other for observation of the picture screen by the projectionist, known as the "observation port" (*see Sec. 1.8*).

The observation port shall be located above and to the right of the projection port. The distance between the horizontal centerlines of the projection port and the observation port shall be 15 inches; the distance between the vertical centerlines of the projection port and the observation port shall be 21 inches.

Where separate spotlight, stereopticon, or floodlight machines are installed in the same projection room with motion picture projectors, not more than one port opening (*see Sec. 1.9*) for each machine shall be provided for both the projectionists' view and for the projection of the light, but two or more such machines may be operated through the same port.

(1.7) *Projection Ports.*—The finished ports shall be 10 inches by 10 inches, measured on the inside wall. The required height of the centerline of the projection port from the finished floor varies with the make and the design of the projection and sound equipment to be used, and also with the vertical projection angle. The manufacturers of the equipment being installed should be consulted for these dimensions.

In no case shall any part of the projector be less than 4 inches from the front wall of the projection room. *Table I* lists two constants for various angles of projection which, when substituted in the formula, will permit calculating the height of the centerline of the port from the finished floor level when certain dimensions of the projector are known.

(1.8) *Observation Ports.*—The finished observation port shall be not greater than

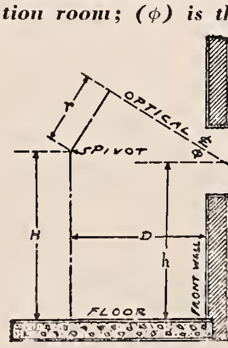
(*Continued on page* 20)

TABLE 1: ***Method of Locating Projector Port***

$$h = H + rA - DB$$

Projection Angle (Degrees)	A	B
0	1.00	0.00
2	1.00	0.04
4	1.00	0.07
6	1.01	0.11
8	1.01	0.14
10	1.02	0.18
12	1.02	0.21
14	1.03	0.25
16	1.04	0.29
18	1.05	0.33
20	1.06	0.36
22	1.08	0.40
24	1.09	0.45
26	1.11	0.49
28	1.13	0.53
30	1.16	0.58

(H) is the height of the center of the projector pivot from the floor; (r) is the radial distance of the optical centerline above the center of the pivot; (D) is the distance of the center of the pivot from the front wall of the projection room; (φ) is the angle of projection; and (h) is the required height of the center of the port from the floor of the projection room. Select the values of (A) and (B) corresponding to the angle of projection, and substitute in the formula.



IN THE SPOTLIGHT

(*Continued from page* 15)

ward Whitford, secretary of Local 376, Syracuse, N. Y. Ed's latest contribution is not only timely but is of extreme importance to the craft, and we have, therefore, taken the liberty of reproducing it in its entirety. Says Ed:

Friend Harry:

At the risk of opening an old sore at a time when it may serve the purpose of some to claim that healing it is impossible, I am impelled to take that chance because of the very nature of the times.

We, whose livelihood depends upon the continued existence and welfare of the motion picture industry, are constantly being impressed with the fact that we must conserve the materials that make the industry possible. It is not enough merely to say that this must be done if we are to survive the present crisis. The responsibility for the conservation of each item must be allocated to those whose duty it is to assume it.

Without a doubt no single item is of more vital importance than the film itself. It must be admitted that no single agency involved in the handling of the film can be held solely responsible for its welfare, but by fixing upon each his share and making acceptance obligatory, a long-needed step of progress will have been taken.

In the sphere related to exhibition are four agencies involved in the care of film: (1) the exchange, (2) the exhibitor, (3) the common carrier, and (4) the projectionist. When the exhibitor contracts for the use of motion picture productions he does not do so in terms of so many feet of film, but in terms of an intangible something called entertainment value. This is delivered to him in a tangible medium called film. Any exhibitor who so far ignores the dependency of the former upon the latter that he fails to perform his share of the responsibility, is liable to find, due to loss of patronage, that it would have been cheaper to have paid what the assumption of his share of the responsibility would have cost. His share, as I see it, follows:

A high percentage of the damage that occurs to film takes place in the projection room. This is due, more often than not, to faulty equipment. It is the duty of the exhibitor to ascertain the exact condition of his equipment and to employ all available means to eliminate existing faults. He should make certain that maximum effort is being made by his projection department to safeguard all equipment and film.

Regardless of the present difficulties involved, the exhibitor who does not provide adequate ways and means for the proper care of film, to the satisfaction of the distributor, may find himself denied the use of it. He would do well to read his contract.

If he does comply by making the provisions I have outlined, he can, in turn,

insist that every effort be made to furnish him with prints that are fit to run. By this I mean prints that are (*1*) in sufficiently good condition to run through a properly adjusted projector without first requiring minute inspection and extensive repairs, and (*2*) prints whose entertainment value has not been seriously impaired or destroyed through lack of continuity of sound and action due to the many deletions made as a result of damage.

It is a lamentable fact that prints are being sent to theatres in a state of mutilation that can be best described as criminal. The projectionist, if he is to put on a show and at the same time not subject his equipment and his very life to unnecessary hazard, must too often spend hours making inspections and repairs. This procedure has hazards of its own, as every projectionist well knows. It is enough to say that on my rewind bench within easy reach there repose a bottle of antiseptic and a box of bandages.

If there was any evidence to support the idea that print conditions are as they are because of the shortage of raw film stock and exchange manpower, and that these are the sole reasons, I would say well and good. But after an eighteen year diet of mangled prints, many of them bearing inspection seals, I say that as a plausible alibi it is at least eighteen years overdue.

If the common carrier will make an effort to treat the film containers as though they were not quite indestructible, a very real contributing factor in film destruction will be minimized. It is the genuine cooperation of all four agencies that will lick the problem and permit the medium of the motion picture to go on doing its marvelous job of aiding public morale.

My very best wishes,

Edw. Whitford.

● The re-election of Joseph Dwyer as president of New York Stage Hands Local No. 1 ("Mother Local" of the I. A.) has just been announced. The annual election of officers was held early this month and other officials re-elected to office were George Fitzgerald, vice-president; John C. McDowell, (an officer of the local since 1908), recording secretary; John J. Garvey, treasurer; Solly Pernick and Vincent Jacobi, business managers, and John Goodson, Bernie Quatrochi and Louis Yeager, trustees. Edward J. Mortimer was elected sergeant-at-arms, and Charles Cayton and Bill Edwards will serve on the relief committee. Lewis Yaeger and John F. Goodson were elected executive board members.

The induction of officers will be held on the 23rd of May with James J. Brennan, fourth vice-president of the I. A. and a former president of Local No. 1, presiding at the ceremonies.

PROJECTION ROOM PLANS

(*Continued from page* 17)

200 square-inches in area, measured on the inside wall of the projection room. A recommended size for the observation port is 14 inches wide and 12 inches high, when measured on the inside wall of the projection room.

(1.9) *Other Ports.*—All other ports, such as for spotlight, stereopticon, or floodlight machines, shall be as small as practicable and in no case shall exceed 7½ square-feet in area per machine. The size and location of these ports will, of course, be determined by the types of such machines to be used. These dimensions should be obtained from the manufacturers of such machines.

(1.10) *Acoustic Treatment.*—It is recommended that an approved fireproof acoustical material be applied to the walls above a height of 4 feet from the floor, and on the ceiling of the projection room, to reduce the transmission of noise into the auditorium and to reduce projector and machine noise within the projection room proper.

Rewind Room

(2.1) *Construction.* — The rewind room, if separate from the projection room proper, shall be of fireproof construction. It shall have a minimum area of 80 square-feet (Figure 1).

(2.2) *Floor.—(See Sec. 1.2).*

(2.4) *Doors.*—The door shall be an approved fire-door of a type suitable for use in corridor and room partitions (Class *C* openings, as defined in the *Regulations on Protection of Openings in Walls and Partitions*), shall be arranged to be self-closing, swinging outwardly, and shall be kept closed at all times when not used for egress or ingress. Door jams shall be made of steel.

(2.6) *Ports.*—Where the rewind room is adjacent to the auditorium, an observation port shall be provided through which the picture screen may be seen from within the rewind room. This port shall be at the same height from the finished floor as the observation ports in the projection room proper (*see Sec. 1.6*).

(2.8) *Observation Port.—(See Sec. 1.8).*

(2.9) *Other Ports.*—An observation window shall be provided between the projection room and rewind room, consisting of a fixed fireproof frame and polished plate wire glass. This window shall be not more than 200 square-inches in area, and shall have its horizontal centerline 5 feet from the finished floor level.

(2.10) *Acoustic Treatment.* — *(See Sec. 1.10).*

Power Equipment Room

(3.1) *Construction.*—The room shall be fireproof and shall be constructed in accordance with Sections *1.2, 1.3, 2.4,* and *1.10.* The size shall be governed by the quantity and kind of equipment to be installed. Generous consideration shall be given to probable future needs.

(3.2) *Special Equipment.* — It is recommended that wherever rotary power equipment, such as motor-generator units, is employed having an input rating in excess of 15 horsepower, such equipment be installed remote from the theatre auditorium, such as in the basement, to prevent acoustical hum or mechanical vibration from reaching the auditorium section of the theatre.

Extreme caution should be taken to insulate properly all rotary equipment that may be located at the projection room level, regardless of size, against the possibility of excess mechanical vibration and hum. All arc-supply equipment located in the power-equipment room, including projection arc rheostats, shall be at least 4 feet from all sound-amplifier units.

Lavatory

(4.1) *Construction.* — The lavatory shall be provided with running water

and modern sanitary facilities, with tiled floor and built-in, flush-type medicine closet.

Exits

(5.1) *General.*—Two exits shall be provided, one at each extreme end of the projection room, permitting direct and unobstructed egress (*see Fig. 1 and Sec. 1.4*). Any stairs forming part of these exits should have risers not in excess of 8 inches and a minimum tread of not less than 9 inches. The distance between walls in any section of the exits shall not be less than 36 inches. Winding or helical stairs should be avoided. A platform at least equal in length to the width of the door shall be provided between the door and the first riser. Neither ladders, scuttles, nor trap-doors shall be used as means of entrance or exit.

Conduits and Circuits

(6.1) *Locations and Sizes.*—Locations and sizes of conduits and wiring for projection control and sound equipment units are determined by the quantity, types, and designs of the equipment to be installed. Manufacturers of the equipment should be consulted with regard to proper layout and sizes of conduit and wiring systems before floors, walls, and ceilings are finished (*see Secs. 1.2 and 1.3*).

Conduits shall in all cases be concealed, and all boxes shall be of the flush type, when located in the floors, walls, or ceiling. Conduits terminating in the floor shall extend 6 inches above the finished floor level. The wiring and conduit layout shall be in accordance with the National Electrical Code. Wiring shall be provided for the following usual circuits, and wiring for special or additional equipment shall also be provided:

(1) *Projector mechanism*
- (*a*) Drive motor
- (*b*) Change-overs
- (*c*) Pilots

(2) *Projectors, spotlights, and floodlight machines*
- (*a*) Arc supply
- (*b*) Arc ballast rheostats

(3) *Sound equipment*
- (*a*) A-c supply
- (*b*) Amplifier controls and power-supply units
- (*c*) Loud speaker circuits
- (*d*) Ground wire
- (*e*) Sound heads

(4) *Projection room lighting*
- (*a*) General
- (*b*) Emergency

(5) *Theatre auditorium lighting*
- (*a*) Regular
- (*b*) Emergency

(6) *Projection room ventilating system*
- (*a*) Normal
- (*b*) Emergency

(7) *Projector ventilating system*
- (*a*) Normal

(8) *Miscellaneous*
- (*a*) Stage curtain control
- (*b*) Telephones
- (*c*) Buzzers and signal system
- (*d*) Receptacles
- (*e*) Clock outlet

(6.2) *Power-Supply to Equipment.*—Where line-voltage variations are greater than ± 3 per cent, the local power company should be requested to correct the condition. In cases where it is impossible normally to maintain steady line-voltage to the equipment, suitable voltage regulators shall be used.

TO BE CONTINUED

AUSTRALIAN MOTION PICTURE INDUSTRY IN BOOM PERIOD

The motion picture is rivaling Australia's favorite sport of horse racing, according to George Applegate, fomer manager of Western Electric's subsidiary there, and who returned recently to New York to take charge of technical engineering activities of the company's export division. The boom times in the Australian motion picture industry are a direct result of increased national income, with the record attendance also brought about by strict rationing of many commodities.

Mr. Applegate also noted that, notwithstanding the boom in the industry, production and repair of Western Electric sound equipment parts has been restricted, as a major part of the company's repair facilities have been converted to war production.

AT YOUR SERVICE

(*Continued from page* 13)

over prism. Next, as it is held in approximate azimuth adjustment, optical is slipped back into holder until a flicker is seen on paper over prism and locking screw is then tightened. Final adjustment with the meter is then made in the usual manner.—R. S. SEAR, *RCA.*

Repairing Monitor Speaker Cones

Monitor speaker cones generally suffer from broken spiders which crack under the strain of excess excursions at low frequencies. By making a cement of mucilage consistency out of film cement to which some more film has been added, and cementing one or two layers of muslin cut into circles of about two and one-half inches in diameter to the cone after the remains of the old spider have been removed, the result will be a practically new cone.

A hole is first located and punched in the center of the cloth circles for the center retaining screw. These repaired cones may seem stiff but they have a surprising low-frequency response and can be flexed by burnishing the stiff fabric material so as to break down the cement. After repairing the cone, it will take full volume even before the cement has set.—A. F. SCHNEIDER, *RCA.*

Lettering Control Knobs

On most control knobs, particularly on the ERPI M-5 Type Control, the numbers that appear on the master knob become worn and for the most part illegible, due to the perspiration from the projectionists' hands. By carefully placing a strip of adhesive tape on the knob and printing thereon the worn out numbers with India ink, a very satisfactory substitute marking may be made. Another method is to type the numbers on a strip of paper, and then fasten the paper in place on the knob with transparent scotch tape.—E. M. KARCHER, *RCA.*

Improving Sluggish Stabilizer Action

I have had several instances where the rotary stabilizer would not come up to speed and settle down for at least fifteen or twenty seconds. Bearings and stabilizers functioned properly, and the pressure roller seemed to be normal. The projectionist in this particular theatre was a very conscientious fellow and never left the roller on the drum when it was not in use, therefore there was no flat spot on it. However, due to normal wear, the roller had worn down enough so that the coil spring in the roller arm would not exert enough pressure on the film to start the drum in motion. The spring was removed, retensioned, and the trouble was corrected.—E. A. DOYLE, *RCA.*

Preventing Sound Outage

The W. E. 214-A deaf set panel uses six resistors totalling about 15 ohms in series with the 500-ohm line coupling the 42A amplifier to the 43A amplifier, or the 200A horn panel. As a general rule, only the speech voltage drop across a 5-ohm section is used. The type 64B resistors used will sometimes open where the resistance wire is brought out, and I have seen two cases of this kind—the one noted above and another which only affected the phones in the booth. The drop across the 5-ohm section is used to drive the input of the 25C deaf set amplifier. To reduce the loss in the line and eliminate the danger of a serious outage at this point, it seems desirable to replace the 64B resistor with a single heavy 5-ohm resistor.—R. E. MCKINSTRY, *RCA.*

S. M. P. E. MEETS IN SIGNAL CORPS PHOTO CENTER

Nearly three hundred members and guests of the Atlantic Coast Section of the Society of Motion Picture Engineers gathered at the Photographic center of the U. S. Army Signal Corps, Astoria, L. I., on April 29. The session was opened by Dr. Alfred N. Goldsmith, chairman of the At. Coast Sec. who, after brief introductory remarks, turned the meeting over to Colonel Melvin C. Gillette, Commanding Officer of the U. S. Army Signal Corps at Astoria.

In his address, Col. Gillette reported on the development of the photographic center which, he stated, started operating on May 8, 1942. He gave a resume of its functions and outlined the various types of training films produced for the instruction of the armed forces. Following Col. Gillette's address, training films were shown illustrating the various types of production, and the meeting concluded with a guided tour of the studios.

UNDERWRITERS CODE

(*Continued from page 12*)

ductor for equipment, and for conduit and other metal raceways or enclosures for conductors, may be a conductor, stranded or solid, insulated or bare, a bus-bar or other conductor, or a rigid conduit, steel pipe or electrical metallic tubing, except that under conditions favorable to corrosion the grounding conductor shall be of copper or other corrosion-resistant material.

2592. *Installation.* A grounding conductor, No. 4 or larger, may be attached to the surface on which it is carried without the use of knobs, tubes or insulators. It need not have protection unless exposed to severe mechanical injury. A No. 6 grounding conductor, which is free from exposure to mechanical injury, may be run along the surface of the building construction without metal covering or protection, if it is rigidly stapled to the construction; otherwise, it shall be in conduit, electrical metallic tubing or cable armor. Grounding conductors smaller than No. 6 shall be in conduit, electrical metallic tubing or cable armor. Metallic enclosures for grounding conductors shall be continuous from the point of attachment to cabinets or equipment to the grounding electrode, and shall be securely fastened to the ground clamp or fitting. Where rigid metallic conduit or steel pipe is used as a grounding conductor, the installation shall comply with the requirements of Article 346: where electrical metallic tubing is used, the installation shall comply with the requirements of Article 348.

MOVIES AID WAR CONSERVATION

L. W. Conrow, president of Altec Service Corp., finds that exhibitors throughout the country, in whole-hearted efforts to achieve a 100 per cent job in the conservation of war-needed materials, are turning more and more to the Altec-originated plan for repair-replacement parts service covering projection as well as sound equipment. He cited a nation-wide list of theatres which recently signed agreements with the company.

The H. S. Leon Circuit, Dallas, Tex., is among those renewing agreements with Altec Service, covering six of its Texas houses. One new theatre has been added. Homan Photoplay Circuit, Chicago, has signed repair-replacement and booth parts contracts for two, and renewed Altec contracts for two other Chicago houses. Other agreements include servicing of ten De-Mordaunt and Drennen theatres in Idaho and nine other houses in Idaho and Oregon. Lou Rome, general manager of the Rome Circuit, Baltimore, has signed a sound and booth parts repair-replacement contract with the organization.

In order to take care of Altec's increased war production activities a new assembly plant, now in full swing, was opened at 236 West 15th Street, Los Angeles, Calif.

Letters to the Editor

To the Editor of I. P.:

In the February 1943 issue of International Projectionist Brother Clint Phare of Cleveland, Ohio, mentioned something about the conservation of film, especially "Date Strips."

Now I don't want to criticize Brother Phare's idea of the black frames on the ends of the date strips, but it seems to give me the impression of blinking an eye between scenes. The black leader is a very good idea if the date strips start with a fade-in and end with a fade-out. I have been cutting my date strips (not quite according to Hoyle) right next to the splice, and only one sprocket hole in a frame is lost. In this way you can get at least three splices to a frame, and it is hardly noticeable on the screen.

I have a suggestion to make to the fellows who don't have a film counter with a marked sprocket to count the fade-outs so as to keep them in frame. Take a worn-out sprocket and notch every fourth tooth with a file. Mount it on an old hand rewinder, or some other suitable shaft and bracket. Place the film on sprocket with the frame line over the notch. Run it over the sprocket until your fade-in or fade-out (whichever the case may be) is in frame. The frame line is on that part of the film that is directly over the notch. This method will save you a great deal of time and you will avoid the tiresome job of counting sprocket holes by fours with a pencil or some other pointed instrument.

Charles W. Zinn
National Theatre
Harrisburg, Penna.

From Far Australia

To the Editor of I. P.:

Herewith bank draft for $2.50, being renewal of my subscription. Tried to get the draft for two years to save expense, etc., but the powers-that-be decreed that the extra $1.50 would put too much strain on the financial resources of this fair land, so we just have to be content with the $2.50.

I am pleased to be able to report that despite all claims from Tokyo about what they are and are not going to do to the Pacific, the magazine arrives regularly, a great tribute to the efficiency of Uncle Sam's Navy, to say nothing of the little bit of help we can give.

Judging from your recent articles you are in pretty much the same position as we are here. Plenty of film but shortage of supplies such as carbons, film cement, tubes, replacement parts and staff. The carbon situation is rather serious, as is that of film cement. However, supplies are being dispersed in small quantities to all theatres, and I have not heard as yet of any undue hardship. We sometimes have to use different combinations than we are used to, but as long as we can get light that is all that matters at the moment.

The general quality of present releases is good, and on account of all the new money that is around business is continuing pretty fair. Of course, locality has a lot to do with that, but generally speaking, people today want relaxation, something to take them away from their worries. With the advent of radio one cannot leave one's worries out on the front porch with the newspaper as one could during the last war. The worries get right into the home, so the little old picture theatre gets some business, especially with good comedy. War pictures are a drag on the market. Bright stuff seems to draw best for, after all, we want a good laugh. It's good for the digestion.

Technical matter in I.P. is eagerly read by all here, and copies are filed for future reference. We have been subscribers through McGill's for quite a number of years. I like the "At Your Service Page." We can do with plenty of that. In this situation we are some considerable distance from a service station, so have to do most of our own service work. An RCA engineer calls

every 12 weeks for a check-up, but there is seldom much for him to do.

Some time ago you had a letter from a projectionist who claimed to be the father of cleanliness in the projection room. My side-kick wants to challenge that statement. He even goes to the extent of polishing the bases of the pilot lamps in the switchboards. In fact, he keeps me poor buying Brasso and silver polish. I am fearful of touching one of the machines for fear that I will leave a finger mark upon it. And there are no moths or carbon stubs in the lamp houses. In fact, even the shafts and coupling of the M.G. set are polished each night with emery cloth.

By the way, we have an idea which we have found to be of great benefit. We have an RCA PG59 high fidelity equipment and, as this is a sub-tropical climate, we found the amplifier used to get hotter than we liked. We now have an 18-inch fan standing about eight feet from the amplifier, which blows on the bottom section, the front panel of which we have removed. This causes a cool current of air to blow right up through the amplifier, and it is now as cool as a nut on the hottest night. You can realize how this reduces the strain on the condensers and transformers, to say nothing of the resistors and, in fact, every part of the job.

We would be pleased if you can put us in touch with some projectionists over on your side of the world. An exchange of ideas would be beneficial to all parties. I am one of those jokers who believes that one can never stop learning, although I am over the fourscore years and ten and have been playing about with pictures for more years than I care to remember.

Hope I have not wasted too much of your time, but just felt in the mood for a yarn. Best of luck.

Clarence Thompson,
Olympia Theatre,
P.O. Box 28,
Kingaroy, Q., Australia.

BAUSCH & LOMB STAGES HIT IN "VISIONS FOR VICTORY"

Bausch & Lomb Optical Co. recently went into show business when it staged its "Visions for Victory" show at Rochester's Eastman Theatre, with six performances being given in three days to crowded houses. In the production were about 150 people, with Milton C. Williamson, the company's advertising manager, chief organizer.

Col. Carlos P. Romulo, General MacArthur's aide-de-camp during the battle of the Philippines, well known through his "Voice of Freedom" broadcasts and the last man to leave Bataan, was one of the stars. He had a real message from a real soldier. Another highlight was Richard Himber and his band, with Marjorie Lee as soloist.

"Vision for Victory" opened with the national anthem, the Bausch & Lomb chorus of 80 voices, accompanied by a 25-piece orchestra, giving a rousing rendition. The chorus and orchestra appeared again in the "Marching Along Fantasy" of popular war songs, arranged by Domenico Savino, and in "The Flying Flag" finale.

One of the effective scenes was the Victory Column upon which silver and gold stars were hung in tribute to company employes lost or killed on active duty.

MATERIAL-EQUIPMENT SHORTAGES HALT THEATRE RECONSTRUCTION

The War Production Board's Service Equipment Division in Washington has let it be known that shortages of building materials and sound and projection equipment are the reasons why reconstruction of burned out theatres will be progressively difficult in the future. A. G. Smith, head of the Amusement Section, states that a four-fold increase in theatre fires during the past four months has taken place, and further adds that it is doubtful if reconstruction of the theatres destroyed will be possible under present circumstances.

Smith highlighted the manner in which fires have been damaging or destroying theatres, declaring that the facts are alarming. There were 43 fires reported during the past four months as compared to 10 during the previous similar period, he said, and that only a few applications for priority ratings are being granted.

In reviewing these applications WPB takes into consideration, in deciding whether to grant assistance, what other theatre facilities are available in individual areas. The difficulties in rebuilding are traced to material and equipment shortages.

I. P. CONTEST

(Continued from page 11)

Projector vibration passed on to P. E. Cell or exciter lamp, which may be loose in its socket.

REMEDY: Check when projector is idle and see if trouble stops.

Loudspeaker defective, shorted speaker field, vibration of loose wires in speaker.

REMEDY: Test with head set. Repair broken wire or replace with spare speaker.

Dirty or pitted commutator on lamphouse feed motor will often cause intermittent crackling in sound system.

REMEDY: Sand commutator and clean brushes and replace.

The following will cause popping noise or motor boating:

An open, short or undesirable high resistance causing one stage to be coupled with another stage.

Where plate circuit accidentally gets coupled to control grid.

An open or shorted by-pass capacitor or insufficient by-pass capacitor in plate or grid circuit of tube.

REMEDY: Clear up trouble or replace with new part.

Additional causes of noise in sound system:

Dirt on sound track.

Slit in sound lens loose.

Dirty horn switches.

Poor or dirty contacts on fader or volume control.

Dirty contacts on switches.

Small continuous digs or scratches in sound track.

REMEDY: Clean contacts. Clean sound track if possible. Mask out digs or scratches on sound track if on outside edge of track.

In addition to the foregoing causes and remedies the following are causes of noise in the old type systems now in use:

Gassy storage batteries used too soon after charge.

Run down B and C batteries that have dropped far below the rated voltage.

Loose or corroded battery connections, also internal connections broken.

Poor contacts on horn switches.

Grid leaks deteriorated through age or old glass type cracked or broken allowing dirt to enter. Also corroded contacts.

Noisy filament rheostats, loose contacts between arm and resistance wire.

Cradle of film amplifier touching sides through vibrations.

Broken strands in P. E. Cell lead making and breaking contact, giving intermittent noise.

REMEDY: Clean part causing trouble or solder broken strands on P. E. Cell.

We could go on indefinitely to relate the methods of attack proposed by the many contestants but, after all, our space is limited. So we are going to cite only one or two more of the particular highlights of the answers. Here is one from William J. Schmitz:

"Ten years ago I was on a job where a crackling noise developed that was not electrical. The reels were insulated at the hub with a small fibre bushing and after running about three minutes the worst crackling and frying could be heard in the speakers. This trouble was due to a static charge being built up and the only way to ground was to jump over this fibre bushing to the spindle of the takeup. Solder pounded into the edges of the bushing and the steel part of the reel cleared this trouble."

James W. Tarr tells us of a very unique experience that he had some years ago.

"I noticed some rather peculiar noises in the sound from time to time and thought that it was due to some defect in the film itself. But during intermission the noise popped up while the machines were idle so I decided that I had better look in the amplifier. On opening the amplifier case I discovered that a colony of roaches had set up housekeeping, using the sound changeover compartment as headquarters. As the roaches moved around they made partial shorts on the changeover switch, which caused the noise. A paint brush served as an effective, temporary means of moving the roaches."

And so we come to the end of the answers to I. P.'s war-time contest questions on how to keep the show going when parts are difficult, if not impossible, to obtain. Even if they are available, deliveries are bound to be slow. So the projectionist must, for the duration, use far more ingenuity than ever before in diagnosing and clearing the trouble, not by going down the street to the local electrical store or simply ordering replacements. He must do much more himself, in many instances using available parts that may be suitable for a temporary repair, but would not, under normal circumstances, be considered for that application. These temporary repairs may have to be used for some time, hence the necessity for careful consideration of their characteristics and their usage in the circuit. Sometimes precautionary measures may be taken to insure a longer life than otherwise.

March Contest Winners

First Prize

RUSSELL A. SCHREMPP
3625a Montana St.
St. Louis, Mo.

Second Prize

GEORGE J. BELTZ
33 9th St.
McMechen, W. Va.

Third Prize

H. D. TAYLOR
1516 Greenwood St.
Raleigh, N. C.

Winners of One Year Subscriptions to I.P.

PAUL COTA
Palace Theatre
Mason City, Ia.

MAURICE RUSHWORTH
531 So. Longwood St.
Baltimore, Md.

WILLIAM J. SCHMITZ
61 Oakdale Blvd.
Pleasant Ridge, Mich.

FRANK SPAINHOWER
Wyoming Theatre
Sheridan, Wyo.

JAMES W. TARR
Cozy Theatre
St. Joseph, Mich.

JOSEPH W. WILLIAMS
163 No. Euclid Ave.
Westfield, N. J.

Honorable Mention

JACK HARWOOD
Globe Theatre
Cleveland, O.

FRED PEARSON
293 Wardin Ave.
Toronto, Can.

MARTIN TEKER
Sheridan
Montana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GM
GIVE YOUR PATRONS THE BEST
Ask Your Supply Dealer For
PHOTOELECTRIC CELLS
VISITRON
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G-M LABORATORIES, INC., CHICAGO

THIS IS NUMBER **4** OF A SERIES OF ADVERTISEMENTS SPONSORED BY THE INTERNATIONAL PROJECTOR CORPORATION MANUFACTURERS OF *Simplex* EQUIPMENT IN COOPERATION WITH THE NATIONAL CONSERVATION PROGRAM

"Care of Equipment is the best War-Time 'Show Insurance'!"

—*says* HARRY RUBIN

HARRY RUBIN
DIRECTOR OF SOUND AND VISUAL PROJECTION PARAMOUNT THEATRES

"UNDER THE STRESS of today's wartime conditions it is the duty of the projectionist to take every possible precaution to keep his equipment operating at top efficiency to assure a smooth-running, uninterrupted performance.

It is not enough to hope for the best. This is a job which requires foresight, planning and constant preparedness!

It calls for frequent check-ups to meet any emergencies which may arise. By so doing, we will eliminate the hazard of permanent or temporary trouble.

As Director of Sound and Visual Projection for many years of one of the largest circuits and some of the finest theatres in this country, I say emphatically—*the proper care of equipment is the best wartime 'show insurance' I know!*"

Harry Rubin

NATIONAL THEATRE SUPPLY COMPANY

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

Simplex

INTERNATIONAL PROJECTOR CORPORATION

INTERNATIONAL PROJECTIONIST

JUNE 1943

VOLUME 18 • NUMBER 6

25c A COPY • $2 A YEAR

TO PROJECTIONISTS!

Visitron cells are available for every type of sound projection equipment. Theatre supply dealers can advise the correct cell for your equipment. Buy from your supply dealer. If you wish to have your old cells tested without charge, write to G-M Laboratories, Inc., for instructions for shipping. Information furnished promptly.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

COPPER CONSERVATION NEWS

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

ISSUED BY NATIONAL CARBON COMPANY, INC., CARBON SALES DIVISION, CLEVELAND, OHIO

Many Theatres Now Sponsor "Copper Matinees"

Novel Plan Adds Much Scrap to Our Nation's Supply

In cooperation with the War Production Board, theatres throughout the country are devoting matinee performances to the Nation's drive for scrap copper. Under the novel "Copper Matinee" plan, boys and girls are given free admission to matinee shows in exchange for a prescribed weight of copper of any type.

This plan, which supplements the drippings-saving program, has brought to light a considerable amount of metal which otherwise would not be made available for war use.

In devoting performances to the collection of copper, the country's theatres are performing a patriotic duty by adding to the available supply of this important metal. The success of the program is important to the motion picture industry, as well as to the country as a whole.

Conservation Program Nets Many Tons of Copper Drippings and Peelings

Wholehearted Cooperation by All Concerned is Reason for Success

The spontaneous response to the copper conservation program in virtually every section of the country has resulted in the collection of many tons of copper drippings and peelings. This accumulation was made possible by the active cooperation of the large majority of individuals connected with motion picture projection.

Reports received indicate that some motion picture supply houses have collected 9,000 to 10,000 pounds and more of copper drippings and peelings. This was accomplished by varying degrees of promotion on the part of these organizations. Advertising in the trade publications, direct mail and window displays showing the amount of scrap turned in supplemented the work of the field organizations in some cases.

The theatres, in turn, have done their part by turning in their scrap regularly.

While the copper-saving record established to date is excellent, it can be improved if *every* supply house and theatre in the country will give maximum cooperation.

Carbon Stubs Should be Prepared in the Theatre

Some theatres, we understand, are turning in unpeeled stubs of used projector carbons. As a result, motion picture supply houses are having difficulty in disposing of the copper scrap.

To facilitate disposition, may we urge you, therefore, to avoid mixing stubs with drippings and peelings.

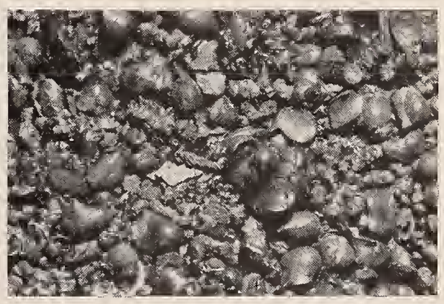
Appearance of Drippings Does Not Affect Their Value as Usable Metal

Uncontaminated Projector Scrap is Shown by Test to Yield at Least 90% Copper

Difficulty has been experienced in some sections of the country in disposing of copper drippings and peelings. Because of the oxidized appearance of the metal, scrap dealers, who judge the copper by its color, will not accept these gray-colored pellets and strips as usable metal.

By actual test it has been shown that if the drippings and peelings are not contaminated by dirt or other material, they yield *at least* 90% copper.

If projector scrap is turned over to the supply houses for handling, the metal will find its way back into the Nation's stockpile without delay.



The photograph above shows the general appearance of copper drippings as taken from the projector lamp house. The color is a dull gray with a few copper-red spots visible. Projector scrap, despite its discouraging appearance, is 90% copper.

Weight of Copper Drippings From Victory Carbons

The following table shows the actual weight of drippings obtained from a unit carton of the various sizes of "National" Victory Carbons.

8 mm x 14″ "Suprex" Positive	3.2 ounces
8 mm x 12″ "Suprex" Positive	2.7 ounces
7 mm x 14″ "Suprex" Positive	1.5 ounces
7 mm x 12″ "Suprex" Positive	1.3 ounces
7 mm x 9″ "Orotip" C Negative	1.6 ounces
6 mm x 9″ "Orotip" C Negative	1.3 ounces

The trade-marks "National," "Suprex" and "Orotip" distinguish products of National Carbon Company, Inc.

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

C. F. Alexander, *Technical Editor*
W. L. Lightfoot, *Associate Editor*

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Monthly Chat

I. P. STARTS its Crossword Puzzle Contest in this issue. We know it will prove as interesting, entertaining and instructive as was the popular war time technical contest, the final details of which appear elsewhere. The new baby of I.P. offers opportunities for the skilled, the technicians and the persevering to show their mettle. It is a new kind of Crossword, prepared especially for projectionists, who will find the answers to many of the definitions simple words that are at the tips of their tongues —or maybe we should say pencils—and in everyday use. But there also are a few answers that really will call for a test of brain-power. And, when everything is said and done, that is where the most fun is in completing a Crossword. We hope that everyone entering the contest will enjoy it as much as we did in its preparation.

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It is sad to read of even one member of our armed forces being wounded in this global war, but the mental pain of the uninjured is eased by the news that since Pearl Harbor 97 per cent of our Naval and Marine wounded have recovered and, further, that about the same percentage holds for the Army casualties. It is a tribute to the medical care and equipment that our country furnishes its defenders, for never before in the history of the world have those on the fighting line been so well cared for.

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A marvel of this war-age is a recently developed electronic control for de-icers on airplanes. To explain: If the de-icer mechanism is actuated before the ice is one-eighth of an inch thick there is a tendency for ice formation to increase rapidly. On the other hand, if ice is too thick before the mechanism is started the latter is ineffective. As a result the new electronic control places the de-icer in operation just at the instant the ice is one-eighth of an inch thick, saving lives and planes. The science of electronics is making tremendous progress to the end that the post-war era will find its scope amazingly broadened toward making better our every-day lives.

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WPB has issued an order which may complicate replacement of defective parts of sound picture equipment. The gist of the ruling is that a defective part must be returned before a new one may be procured. It stands to reason that in some instances removal of a part in need of replacement will stop a show completely, whereas some worn equipment may be operated after a fashion if it remains in place. The ruling is being protested, but clarification is essential. WPB, we believe, will do its part to keep the shows of the country going, for they are integral with essential entertainment to keep morale at its peak.

INTERNATIONAL PROJECTIONIST

VOLUME XVIII JUNE 1943 NUMBER 6

16- Versus 35-mm Projection in Army Training Camps

Presented herewith is an unofficial report by the former editor of I. P. on the army's use of motion pictures, and possible repercussions on the future of the civilian industry, based on his own observations in the army. The wide reliance on 16-mm projection, and its practical acceptability in spite of the fact that it is much inferior to 35-mm projection, are especially noted. A possible surplus of projectionists as a result of army training, and the army's future surplus of projection equipment, are taken into account in some speculations on possible changes in the nature of the post-war industry.

THE average soldier in training probably sees more pictures per week than even the most ardent civilian movie fan. Pictures are the chief form of entertainment available to those men who cannot leave camp. And very often men cannot get a pass, or the nearest town is too far away, or they are too tired or too broke to go to town. And if they are rookies they particularly relish a form of entertainment that allows them to spend the evening sitting down.

Moreover, the soldier's interest in pictures is very strong. When he does go to town, as often as not he winds up at the movies. He is fussy about his pictures; he looks over the schedule of shows available in camp and of those he can see in the nearest civilian theatres, before deciding how to spend his evening. He takes his movies seriously.

But entertainment represents only a fraction of the time the soldier in training spends looking at a motion picture screen. He sees a great many pictures prepared by the Signal Corps for training purposes, attendance at which is compulsory. The educational value of these pictures is striking. With the help of animated cartoons they can pack more information into five minutes than can be gotten from hours of reading text-books or hearing lectures. For example, men in radio and electrical training courses see the action of vacuum tubes explained by animated cartoons that show electrons moving through pipe-like wires, and being emitted from a cathode, with the grid of an amplifying tube controlling traffic. The soldier who was a bookkeeper or a tailor in civilian life comes away with a surprisingly clear impression of electrical fundamentals.

Subjects of more specifically military nature, such as proper drill and saluting; construction of trenches or of tank traps; identification of friendly or hostile aircraft and friendly or hostile tanks; personal hygiene and a host of other matters the soldier must learn, are taught very largely by means of Signal Corps movies. A special effort is made, also, to integrate the pictures with actual training.

By *AARON NADELL*

Thus, the rookie may be given a little practice at drilling, then he is taken to see a movie showing the right way to drill, and then back to the field to practice some more. Similarly his attendance at other training pictures is planned to coincide with the time he is actually practicing or learning the particular subject the picture covers; generally in such a way that he does a little practical work, then sees the picture, and returns again to more of the practical work.

The number of training pictures is very large, and the range of subjects they cover is enormous. They teach everything from the right way to put up mosquito netting to the right way to repair a truck.

16- and 35-mm Equipment

Both 16- and 35-millimeter projection is used, always with sound. Entertainment is commonly provided by means of standard film and apparatus. Training pictures, however, are usually, though not always, on 16-mm stock.

The 35-mm equipment is of standard commercial types, indistinguishable from that found in the average well-kept small theatre. Training camp theatres of the Army Motion Picture Service are apt to have between four and six hundred seats, and commercial equipment designed for

the average smaller theatre meets their needs perfectly.

This apparatus is installed in a projection room of conventional design, equipped with all the usual fire precautions. Screens are of perforated types, with loudspeakers mounted behind them —in short, as far as 35-mm projection goes, there is no important difference between the equipment of the camp theatre and that of the civilian theatre of equal size just outside the camp.

But the 16-mm apparatus is of portable type, and it is not set up in a projection room. The projector will be mounted on a table in the center aisle of the theatre; or if there is no center aisle the projector will be set up on a board laid across the backs of two seats. The regular 35-mm screen is used (without masking it down) but the 16-mm portable speakers, which connect to the projector by flexible cables, will simply be placed somewhere on the screen platform without much fuss as to just where they are located or how they are pointed.

The same 16-mm equipment will be taken from the theatre and carried to various classrooms, as occasion requires. In the classroom, again, it is set up on a table at the center or rear; the loudspeaker or speakers are placed somewhere or other near the front of the room, and the picture is projected on a screen set up for the purpose, often one of the window-shade type.

When 16-mm entertainment pictures are available, the portable apparatus may be taken of an evening to the camp's recreation hall, and set up there much in the same way as in a classroom.

Operation of Equipment

Projection of 35-mm pictures is entrusted to a soldier selected for that purpose, who may or may not have been a projectionist in civilian life. In some cases the soldier is permanently attached to the staff of the camp as a projectionist, and projection is just about his only duty. But he may also be one of the men temporarily stationed at the camp for training, with his projection work added to his training schedule. When his training is completed and he moves on, he is replaced by another soldier in similar circumstances. In either case he receives extra pay.

There may be several projectionists in each army theatre, but not necessarily more than one man in the projection room at a time. Sometimes the shortage of projectionists is so acute that one man does all the work and can't get out of camp at times when entertainment pictures are shown. Since they are commonly shown every evening, including Sundays and holidays, the projectionist so situated is in a bad spot—he never gets an evening off.

Ordinary repairs, and minor adjustments looking to improvement of the quality of picture or sound, are also the business of the soldier-projectionist. Some of these men take their work just as seriusly as in civilian theatres, and put in much extra time and effort—for which they are not specifically paid—trying to improve their screen results.

The quality of sound and picture is about equal to that of a civilian theatre of corresponding size. Breakdowns and interruptions do occur, but probably not much more often than in any other theatre.

The 35-mm projectionist does not necessarily have anything to do with 16-mm equipment. To the contrary, it sometimes happens that a 35- and a 16-mm training picture will be run one immediately after the other in the same army theatre, during hours when the theatre is used for training purposes. In that case the projectionist may remain in the projection room while another soldier takes charge of the 16-mm apparatus located in the center of the auditorium.

The 16-mm film is projected on the full-size 35-mm screen but does not cover the entire screen. The blank areas of the screen are not masked. Even when 16-mm projection is used alone, as in a schoolroom or recreation room, there is no particular effort to make the picture fit the screen or to mask the screen to fit the picture. An area of blank screen is taken as a matter of course. This is not true of 35-mm projection, which is treated much more critically. Similarly, 35-mm speakers are carefully positioned and pointed, while the 16-mm portable speaker is just put down somewhere near the screen, and faced roughly in the general direction of the audience.

16- and 35-mm Results

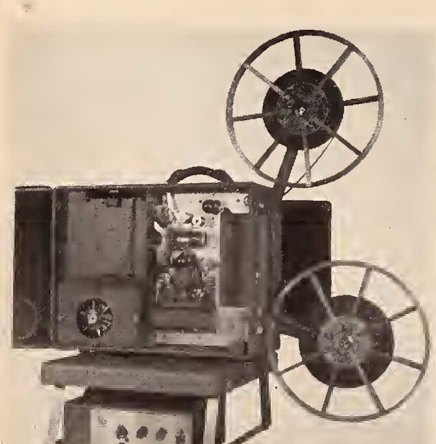
An ideal opportunity to compare results of 16- and 35-mm projection is afforded when both types of film are shown, one immediately after the other, in the same army theatre. This is sometimes done during training periods, according to the types of training films available. Additionally, the soldier may see a 16-mm training film in the theatre during the day, and a 35-mm entertainment program in the same theatre during the evening.

To a critical judgment, the two types of results are not in the same class at all. The 35-mm projection is infinitely better. The screen is far brighter. Details are clearer. Sound is very evidently superior.

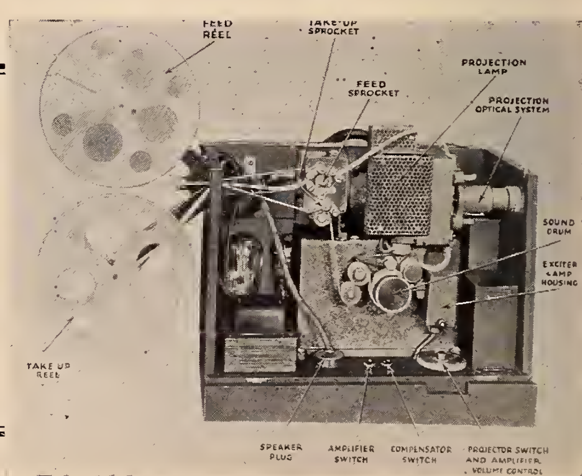
What is surprising is how little those differences matter in practice. When a 35-mm film comes to its end, and the screen is dark a moment, and then the 16-mm takes over, the contrast is glaring. But within a minute or two that is forgotten, and if the 16-mm program is interesting the soldier audience concentrates on it and forgets all about its quality. Neither do the men comment on the difference in quality when talking over the pictures afterward. They forget that.

Of the twelve million or so citizens who will see a great deal of 16-mm before this war is over there are bound to be some who will come back to civilian life with the idea that 16-mm projection is an industry with great possibilities. Also there are bound to be school teachers

(*Continued on page* 18)



Left: Portable 16mm sound projector. Right: Layout of a typical 16mm sound projector. The detail arrangement of the components varies in different designs, but the essential parts indicated in the illustration can be found in all makes.



Technical Analysis of a Sound System for Small Theatres

By *LEROY CHADBOURNE*

THE sound system presented here is representative of a type that is suitable for the smaller theatre, which actually constitutes a large proportion of the theatres in the country. It is made up of the minimum number of units. Each unit is compact, is quickly and easily installed and thus there is the least difficulty in finding space for the units in the projection room. There are many projection rooms where space is at a premium and there just is no space at all for a number of bulky sound system cabinets.

And the system analyzed herein is, of course, operated from alternating current throughout, even to the lighting of the exciter lamps. The number of component parts in each unit has been reduced to a minimum, simple circuits have been used and the units are readily accessible for inspection, servicing and parts replacements. All of these factors add up to give a utility system comparable with the needs of the small theatre.

The block diagram shown in Figure 1 and the overall schematic shown in Figure 2 are two conventional methods of illustrating how sound systems function. In Figure 1 the various component units are represented by rectangles suitably labeled, and the sound circuits are indicated by heavy lines with arrows pointing in the direction the sound travels. Power circuits, either d.c. or a.c., are represented by light lines with arrows indicating the direction of the power travel.

Figure 1 also tells us there is one fader for each machine, and that it is not in the sound circuit. Since the exciter lamp supply runs to the fader, it will be seen that the changeover is made by the exciter lamp. Note that the soundhead output runs directly to the only amplifier shown; therefore this amplifier must be a combined voltage and power amplifier.

Also shown in Figure 1 is a 400-cycle crossover network with a standby switch. Now, we may assume that the purpose of this switch is to disconnect the high frequency speakers in case of failure to function properly, and to connect the low frequency speakers across the output of the amplifier. There also is shown a loudspeaker coupling transformer for each type of stage speaker, for impedance matching. In addition, a monitor speaker and the source of the PEC polarizing potential will be noted in the diagram.

Now, referring to Figure 2, let us analyze the overall schematic shown, beginning in the lower left-hand corner. You will note a block designated *"exciter lamp transformer and preheat resistor."* This transformer supplies a.c. power to the exciter lamps under the control of the two switches directly above. If we trace the circuit from the right-hand terminal of the upper winding (secondary) of the transformer to the right and up, left and down, we pass through both exciter lamps, through a strap in the left-hand switch and to the left-hand terminal of the secondary of the transformer. The exciter lamps are thereby found to be in series. The resistor, with the switches, as shown, is connected in parallel with the left-hand exciter lamp. Since the current is divided between the lamp and the resistor, reduced current flows through the lamp or, as is commonly stated, the lamp is being preheated and the right-hand machine is the "ON" machine.

Suppose we operate the right-hand switch. Current passes through the resistor, through the left upper contact of the right switch to the upper right contact of the left-hand switch and thence to the right-hand terminal of the secondary

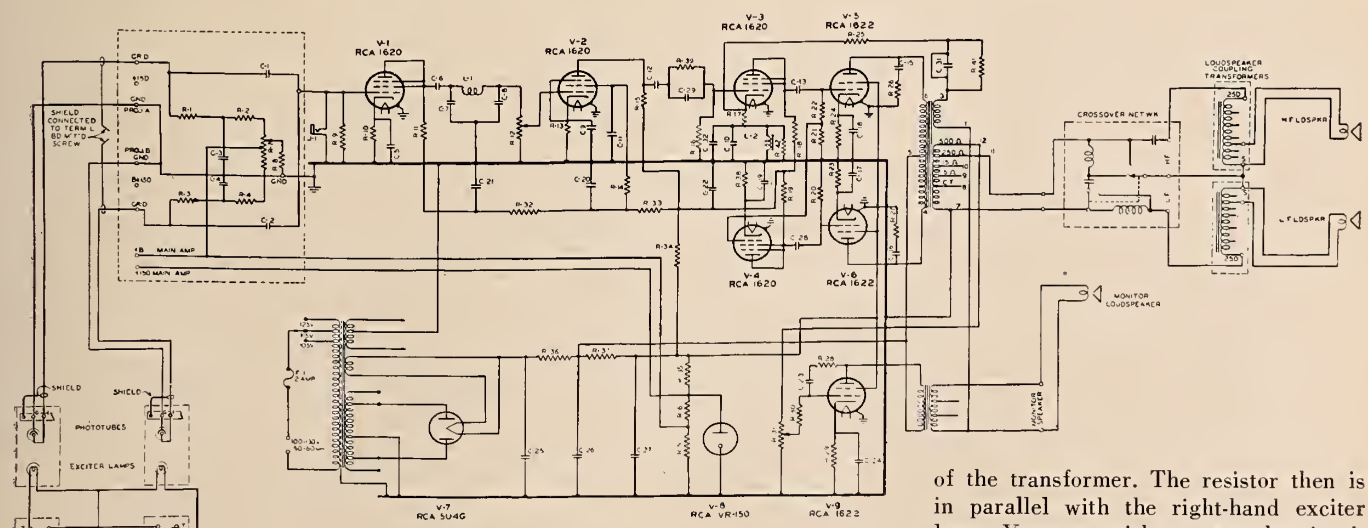
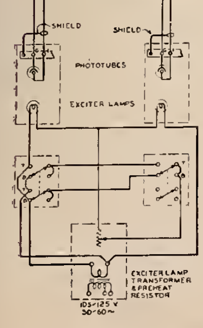



FIGURE 1
Overall schematic of RCA PG-146 sound system.

of the transformer. The resistor then is in parallel with the right-hand exciter lamp. You may wish to trace the circuit with the left-hand switch operated to verify that the resistor is in parallel with right exciter lamp. These switches constitute a three-way circuit, whereby changeover may be made at either ma-

chine regardless of the machine in operation.

Just above the exciter lamps are the photocells. Let us follow the right-hand line from each cell to the "Grid" terminals and through the series resistors to R_7. Note that this is adjustable and that there is also a fixed connection near the upper end which may be traced back to the junction of R_5 and R_6 as the source of PEC polarizing potential. R_7 is the means of adjusting the polarizing potential and thereby balances machine outputs. As the slider moves up in the figure, the drop through the section of R_7 from the fixed connection to the slider increases due to the slider being connected to ground through the resistor R_8. So the output of the left-hand machine decreases. Conversely, when the slider moves down the output level of the right-hand machine decreases.

The resistors R_1, R_2, R_3 and R_4 and the capacitors C_3 and C_4 act as a filter mesh to smooth out any ripples that may have passed through the main filter circuit in the amplifier. Note that the "Grid" terminals are connected through capacitors C_1 and C_2 to the grid of the first tube of the amplifier. We have then conclusive proof that changeover is by exciter lamp only.

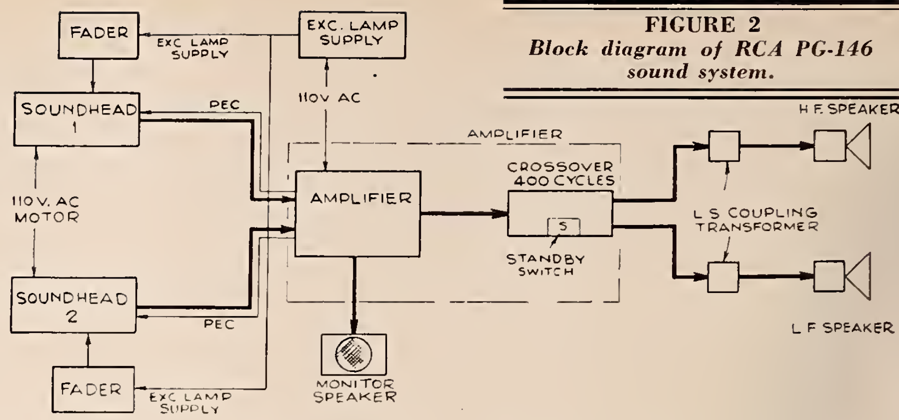


FIGURE 2
Block diagram of RCA PG-146 sound system.

Filters Out Beats

The first tube is connected as a triode, but note that the cathode resistor R_{10} is by-passed by C_5 which, in accordance with previous discussions in these columns gives us a high end rise. Beyond the coupling capacitor C_6 there is a low pass filter composed of the elements L_1, C_7 and C_8. Signal frequencies up to a certain value, called the cut-off frequency, pass through this filter with practically no loss, but above this frequency the loss increases as the frequency increases. Such a filter may be used to eliminate radio stations; that is, pickup, or it may be used to reduce the high end response of the amplifier. Since radio station pickup modulates the sound system signal, or, in other words, is superimposed upon it, we have a complex wave form which may produce beat frequencies that are disturbing. Therefore, this type of filter for radio station elimination, filters out the beats, leaving only the sound system signal.

Such a filter, when designed for reduction of the high end response, operates as follows: The inductance L_1 suppresses the passage of signals increasingly as the frequency rises, and the first capacitor C_7 offers a lower impedance path the higher the frequency. Hence, as the frequency increases and since signal currents always take the lowest resistance path to ground, more and more of the signal flows through C_7 to ground. C_8, of course, performs the same function.

The values of the elements of this filter determine the frequency at which the attenuation begins and the rate at which the signals are by-passed. A filter in which the signal level drops off rapidly is known as having a sharp cutoff. Some filters have a very slow rate of attenuation, and the cutoff can be known accurately only by calculation. When plotted graphically we would see a smooth curve extending downward as the frequency increases.

The main volume control of the system is R_{12}, which controls the signal voltage applied to the grid of the second tube in the regular way. The cathode resistor of the second tube is by-passed by capacitor C_9. The second tube is a pentode resistance coupled to the third tube in the standard fashion.

Low End Equalization

Passing through the coupling capacitor C_{12} we come to a resistor-capacitor mesh consisting of R_{39} and C_{29} in parallel. Here we see evidence of low end equalization. Remembering that capacitors pass high frequencies readily but attenuate lows, it is evident that as the frequency increases, the value of the mesh approaches zero, while as the frequency decreases the value of the mesh approaches that of R_{39}. We therefore expect that there will be little attenuation of the higher sound frequencies, but as the frequency decreases the loss through this mesh will increase. If C_{29} were disconnected the loss would be the same; that is, the maximum, at all frequencies.

The third tube is the driver for the push-pull tubes V_5 and V_6 in conjunction with the phase inverter tube V_4. Here again V_3 is connected as a triode, but note the mesh in the cathode return circuit. We find R_{17} in series to ground with the parallel combination of C_{32}, C_{10}, L_2 and R_{42}. A glance at this mesh makes us strongly suspect that it is a tuned circuit; that is, the inductance in parallel with the capacitors will at some frequency—in this case 120 cycles—present a maximum impedance to the passage of the plate current, which has been modulated by the signals flowing from grid to plate. Thus the voltage across the R_{18} will be a minimum and the gain of the stage likewise a minimum. The path for the modulated cathode current from ground is through C_{22} and R_{18} back to the plate.

Going back to the mesh, it is well known that a capacitor and inductance in parallel present the maximum impedance when the impedance of each is the same. Below that frequency the impedance of the inductance decreases and approaches zero at zero frequency or when the current is direct. Above this frequency the impedance of the capacitor decreases until at an infinite frequency it likewise becomes zero.

Note that R_{42} is also in parallel with the inductor-capacitor combination. This resistor cushions the effect of changes in the capacitor-inductor above and below the resonant point and thus determines the attentuation of the unwanted frequencies.

Passing through V_3 and the coupling capacitor C_{13} observe that R_{22} and R_{21} are connected in series from the grid of V_5 to ground and from the junction of these two resistors a connection is carried to the grid of the phase invertor tube V_4. Remembering that the output of a tube is 180 degrees out-of-phase with the input, then the signals on the grids of V_3 and V_4 are out-of-phase as required for push pull operation of the tubes V_5 and V_6. These latter tubes are connected in conventional fashion with the outputs loaded by a capacitor and resistor to ground. The secondary of the output transformer consists of two windings, one for feedback and the other for signal transmission to the crossover network. This latter winding has five taps for impedance matching to the network. The connection indicates that the input impedance of the network is 250 ohms.

The upper secondary winding of the output transformer continues upward through the C_{31}, R_{41} mesh, through R_{25} to the cathode of V_3. This is our feedback circuit, which as we know may be for hum cancellation only or it may also

evolve into a warping circuit for frequency response equalization. Considering R_{25} alone it is obvious that it attenuates all frequencies equally and, therefore, its value determines the strength of the signal returned to the cathode and hence the degree of cancellation.

Frequency Selection

However, when the mesh of C_{31} and R_{41} are added the picture changes. Here we have frequency selection. With the strap across C_{31} removed, the impedance of the mesh decreases as the frequency increases, a portion of the higher frequencies will therefore be cancelled out and the high frequency response of the amplifier will decrease. We thus have two adjustments. one with strap connected, whereby all frequencies are attenuated equally and the other with the strap removed, whereby the higher frequencies are attenuated.

The crossover network is of the series type. If you trace the circuit you will note that the 250 ohm tap of the output transformer is connected through a capacitor to the 250 ohm terminal of the loudspeaker coupling transformer. From there the circuit is from the tap on this transformer through the *HF* speaker to terminal "*S*" on the transformer. The circuit is similarly traced through the *LF* speaker back through a choke to the common of the output transformer and thence to ground. When signal frequencies are impressed on the input terminals of the network, those frequencies above crossover pass through the capacitor in series with the upper *HF* terminal through the speaker and return through the capacitor just below the vertical inductance to ground.

Frequencies below crossover pass through the vertical inductance to terminal "*S*" on the *LF* loudspeaker transformer, through the *LF* speaker and so forth to terminal 7 on the output transformer. At crossover the power is equally divided between the low and high frequency speakers.

The standby switch, shown in Figure 1 is represented in Figure 2 by the six circles and the lines with an arrow at the end of each. This represents a double-pole, double-throw switch, and is shown in normal position. In standby position the horizontal switch arrow moves upward and the vertical switch pointer moves to the right. In this new position it is readily seen that the low frequency speaker is directly across the output of the amplifier and that the high frequency speaker is inoperative since the vertical capacitor is no longer connected to ground.

A single stage monitor amplifier. transformer coupled to the monitor speaker. is shown in the lower right hand corner of Figure 2. Its volume control is R_{31}, which controls the voltage applied to the grid. Note the resistor R_{28} and the capacitor coupling the plate to the grid. This gives us some feedback of the high frequencies and therefore reduces the high end response of the amplifier. Since numerous monitor speakers are designed for voice frequencies only it seems safe to assume that this circuit is arranged to attenuate those frequencies above the voice range.

Just a few words about the rectifier and main filter circuit and then we must close. The conventional full wave rectifier arrangement is shown with a power transformer tapped for supply voltages of 105, 115 and 125. However, we do see a capacitor input filter instead of the choke input type. The type of filter shown gives a higher voltage due to the action of the capacitor and adequate filtering is obtained by the use of series resistors interspersed with more capacitors.

The interesting part of this circuit lies in V_8. This is a voltage regulator tube and is for the purpose of stabilizing the voltage to the PEC in case of fluctuations in the a.c. supply voltage to the rectifier. This tube has the characteristic of passing increasing amounts of current as the voltage across it increases. So if the voltage at the junction of R_6 and R_{35} increases above the nominal for which the primary tap of the transformer was set, this tube very quickly permits more current to flow through it. The drop through R_{35} increases and the voltage at tbe junction then returns to normal. If the voltage drops, the tube passes less current and the lower drop through R_{35} then increases the voltage at the junction to normal. These tubes, when used in properly designed circuits, can be expected to hold the voltage within very close limits with rather wide variations in line voltage.

Invites Cooperation to Study Television Sponsorship

DECLARING that television is far simpler, much less expensive and nearer the commercial stage than most people réalize, Allen B. Du Mont Laboratories, Inc., invites broadcasters. advertisers and advertising agencies to join them in studying and experimenting with telecasting technique without cost for studio and station facilities. The aim is to round out the sponsorship angle comparable to the engineering and programing angles already solved to a high degree; in other words, to get the answer to the question: "How will television programs be paid for?"

The Du Mont concern. operating television station W2XWV, New York, for several months has been on the air Sunday evenings with a scheduled program of professional entertainment. The programs are strictly of the sustaining category, the talent being paid for and, as a consequence, an audience numbering several thousands are following the presentations.

Du Mont, in addition to the Sunday evening program, aims to study and formulate a satisfactory advertising or sponsorship practice in collaboration with those seeking to be identified with the business end of future television.

While no Du Mont studio or transmitting equipment can be built at the present time while the company is virtually fully occupied with war production, potential telecasters are studying the new art, making plans and. in many instances filing applications for future television licenses. According to Allen B. Du Mont television will go commercial overnight. "The engineering end is ready. Programing is already reduced to a definite formula, with trained studio personnel and a host of entertainers with actual telecasting experience. And now. with proper formulation of sponsorship through actual practice at no cost to advertisers and agencies, we can set television definitely for immediate commercialization following the end of the war."

LESTER ISAAC INDUSTRIAL CONSULTANT TO W.P.B.

Lester B. Isaac, supervisor of sound and projection for Loew's, Inc., has been appointed special industrial consultant to the War Production Board Amusements Section. Isaac's chief function will be the planning and execution of methods whereby projectionists and film exchange workers may handle the new high-speed film more safely and efficiently. His appointment to this important post will not interfere with his regular activities with Loew's, and it is understood that he will be granted as much time as is necessary to devote to his new duties.

CHANGE IN AUTHORITY

The Amusements Section of the Service Equipment Division, War Production Board, is now handling all problems related to the production and purchase of 35 mm. motion picture projectors, sound systems, accessories and collateral equipment. Control of manufacture and distribution of motion picture projectors previousy had been handled by the Consumer Durable Goods Division. Applications for authorization to produce such equipment, as well as permission to purchase equipment, should be referred to the Service Equipment Division.

I. P.'s Contest of Skill and Wits on Wartime Projection Closes

THE contest in wartime projection sponsored by I.P. was rightly labeled as a test of skill and wits. Numerous contestants have written us frankly that it made them use the old gray matter. The problems were not easy to solve, but they were not presented simply because they were difficult. On the other hand they were collected from many years of experience with sound systems. In the opinion of the editors they were problems that had been encountered not once but on numerous occasions by sound system service men. Therefore, they were practical and not theoretical questions.

From the beginning we hoped—and we have written this before—that this contest would promote the thinking of the projectionist along the channels of what to do in an emergency. Further than that, we also had hoped that each projectionist would study his particular system, determine what might fail and then plan, and in detail, just what steps he would take to clear the trouble. Having progressed so far, he would continue and provide the necessary devices to clear that emergency.

The old proverb: "A stitch in time saves nine" is still too true. And still another proverb is just as true today as when it was written: "The best laid plans of mice and men gang aft agley." It is a trait of human nature to make the best of plans and then not to carry them out. During this emergency war period we cannot just make plans and then say that we will carry them out tomorrow. Tomorrow never comes. Let us repeat that devices for emergency repairs should be provided now and should be stored where they can be found immediately.

Interest Is Gratifying

The many letters received, telling how much projectionists have enjoyed the contest, have been very gratifying. Many have said: "Keep the contest going." We say: "We're glad you liked it".

There is something to look forward to, however, in a new contest we are working on now. You may be assured that it is going to test your skill and wits in a new manner. It also will be educational. Let us review some of the facts that have been learned in this contest of wartime projection:

The first question related to a burned out power transformer. Assuming that the only power supply is a.c., then only a suitable transformer or power supply can be substituted. Many of the projectionists have thoughtfully provided transformers with a multiplicity of taps so that they can obtain practically any voltage required. This is excellent, but suppose this were carried a step further and a power supply unit were built. Then, in case the complete power supply and filter failed, the new one could be quickly connected if properly planned in advance. You may say that parts cannot be obtained, but how about winding the transformers and chokes yourself? It will prove very interesting and if you look around you can quite possibly fin laminations and other hard-to-find elements. If d.c. is available there is the possibility of providing a voltage divider circuit for plates and heaters if the supply voltage is suitable. Otherwise a voltage doubler circuit may be built.

Stripped Gear Problem

That stripped gear question that came second would not have been troublesome at all under normal conditions, but at the present time it really is something. Under present conditions the solution depends entirely upon local conditions. If you are fortunate enough to be able to get some work done at a machine shop, then brazing in a new section and cutting teeth seems the best procedure. If not, you may have to make the repair yourself—and then the contestant's proposal to drill holes, setting in studs and filing them to shape is a practical solution. This would be laborious if done by hand and the result might be discouraging. If the teeth do not approach very closely those of the meshing gear then we may expect vibration, noise and excessive wear. A repair of this type could not be expected to give long service, but it might just tide you over until a new part could be obtained.

The failure of a coupling transformer came next. Here we have several types: input, interstage, push-pull driver, and pushpull output. You may say that all of these can be replaced by resistance coupling. That is generally true, but unless changes are made in the tube circuits, in some instances not only will there be a loss in gain, but audible distortion. There are so many combinations of components used in the various

Motiograph dealers discuss post war policies at recent Chicago get-together. Left to right, standing: W. D. Mathews, Purchasing Agent, Motiograph; R. F. Sherman, Sec.-Treas., Motiograph; H. C. and J. F. Dusman, Baltimore; I. M. Cohen, Monarch Theatre Supply Co., Memphis; W. R. Howell, Oklahoma City; Harold Abbott, Abbott Theatre Equipment Co., Chicago; Nate Bernstein, Monarch Theatre Supply Co., Memphis; R. A. Smith, The Ray Smith Co., Milwaukee; Nash Weil, Wil-Kin Theatre Supply, Atlanta; T. L. Shearer, B. F. Shearer Co., Seattle; Joe Hornstein, Joe Hornstein, Inc., New York City; H. I. Tegtmeier, B. F. Shearer Co., San Francisco; and R. G. Colvin, Exhibitor's Supply Co., St. Louis. Seated: W. E. Carrell, Falls City Theatre Equipment Co., Louisville; O. J. Hazen, Service Theatre Supply Co., Salt Lake City; Roy Boomer, Sales Mgr., Motiograph; A. E. Thiele, Des Moines Theatre Supply Co., Des Moines; Sam Steinberg, A. & S. Steinberg, Pittsburgh; and L. P. Langford, Oliver Theatre Supply Co., Cleveland.

circuits employed that it is quite difficult to give any general solution.

Here again it might be fun to wind your emergency audio transformer, providing a sufficient number of taps on each winding so that it may be used anywhere in your system. Otherwise the use of resistance coupling should be planned. Compact units can be made on a piece of bakelite or fiber that can be connected quickly in place of the transformer. But do not forget to check the circuit and determine whether a coupling capacitor is required. Remember that these transformers are of the separate winding type and the windings are insulated from each other. Check, too, whether the plate current goes through the transformer. If so, the unit must make provision for this supply. Some loss of gain may be expected, but this can be kept to a minimum if the loading is proper. These units should be made up in advance and tried out, then make any necessary adjustments to obtain best results.

Volume Control Trouble

"What do you do when the main system volume control or fader becomes defective and beyond repair?" came next. These volume controls are essentially potentiometers and in many instances of the constant impedance type. By this we mean that no matter what the setting of the potentiometer is, the input and output impedances remain the same. The most obvious replacement is a fixed attenuator pad which presents a loss that gives the equivalent of the average setting of the fader. A T-pad is the most generally satisfactory type to use. It does not provide compensation for the difference in level between reels or between news reels and the feature.

Some slight adjustment may be obtained by varying the exciter lamp current or photocell current, whichever is possible. An alternate might be the addition of an ordinary potentiometer in the output leg of this pad. This will change the impedance somewhat, but should be satisfactory for an emergency. You also might build a volume control yourself. It should be an interesting problem and the result should be carefully tested in the system before using it in an emergency. Range of volume control is important, although any emergency device may be built around the average operating level, taking into consideration level differences in the various films shown. Impedance mismatch will cause quality deterioration, but generally a fair amount of mismatch can be tolerated without too noticable a change in quality.

The question on two-way dividing networks followed and here it is very important to note that while low frequency speakers can be operated across the full output of the amplifier, high frequency speakers must be protected from low frequencies. The reason is that the amplitude of the lower frequency signals is so much larger than that of the high frequency signals that when the diaphragm of the *HF* speaker attempts to follow these signals it is ruptured. In case of failure of the *HF* leg of a two-way dividing network the *LF* speaker should be connected directly across the output of the system amplifier. A simple circuit with usually a double pole double throw switch can be devised to accomplish the changeover. It is granted that the quality will not be what it was, but sound will be intelligible and the interruption should only be long enough to localize the trouble and throw the switch. Be sure, however, in connecting such a circuit that no capacitors or coils are left hanging on the circuit to bypass any of the frequencies from the *LF* speaker.

And then we had the question relating to the failure of a device, other than belt, that mechanically couples the drive motor to the sound head. Generally, such a device is a so-called flexible coupling, which is somewhat flexible throughout 360°. It reduces the transmission of any motor vibration to the sound head and at the same time will transmit power uniformly with a slight misalignment between the motor and sound head shafts. It is very desirable, therefore, that the substitute have some degree of flexibility.

Just what form the temporary coupling may take depends to a large extent upon what items are available locally. The use of a short length of heavy duty rubber hose, garden hose or automobile radiator hose having a fabric interlining seems most promising. The method of clamping this hose to the shafts deserves very careful consideration. Remember that the starting shock is severe and it tends to split the coupling and loosen the clamps on the shafts. This clamp should grip the device firmly, taking advantage of the flats on the shafts and also should be of fair width to provide as much clamping area as possible. With careful selection of parts and previous testing of the device it should give a reasonable amount of service. All you can do then is to hope that it lasts until a new part can be obtained.

Popping Noise Mystifies

The final question, relating to the crackling and popping noise in the system, as previously stated, is a very common but often obscure, cause of ex-

(*Continued on page* 22)

Jack Sawyer: Pioneer Projectionist

On a spring afternoon in 1906, an eighteen year old boy walked along a street in Buffalo, New York, jingling a few coins in his pocket and wondering where he could find a job.

Attracted by colored lights before what appeared to be a vacant store, he went inside and discovered that he was in what at that time passed for a motion picture theatre. Fastened to the wall at one end of the room was a wooden projection booth and a hundred or so kitchen chairs were arranged for the comfort of the audience. He asked the owner whether he needed help, stating that he was familiar with the operation of motion picture projectors. An operator was needed and he got the job. The pay was $18 a week—big money for those days.

This juvenile projectionist of yesterday, John W. "Jack" Sawyer, is today the Supervisor of Projection for the Shea Theatres in Buffalo. Since that eventful day in '06, Jack Sawyer's chief interest in life has been motion picture projection. As a result, he stands today among those pioneer projectionists who have contributed immeasurably to the development of the industry and to better projection. He became associated with the Shea Theatres in 1917, and in 1939 Mr. Michael Shea appointed him to his present position with the Shea circuit.

Jack is a member of Buffalo Local No. 233, married and has a sixteen year old son. He confesses to few interests outside his work, but does admit that he is fond of mountain air and retires to a mountain lake resort for his annual summer vacation.

Jack's history is typical of many pioneer projectionists throughout the United States and Canada. From time to time we shall present brief word portraits of leading figures in the motion picture projection world. This is the first of the series.

IN THE SPOTLIGHT

By HARRY SHERMAN

THE CANADIAN legislature has finally outlawed company unions and collective bargaining now is mandatory in Canada. Labor may well be proud of this victory which was strongly opposed by reactionary forces in that country who tried desperately to defeat this measure through the medium of a powerful newspaper advertising campaign. Although the labor interests wanted a three-man court, a Supreme Court judge will be the final arbiter in all matters involving labor unions. This act excludes bargaining agencies and "*any such union or association the administration, management, or policy of which is dominated, coerced or improperly influenced by the employer in any manner whether by way of financial aid or otherwise.*" This definitely sounds the death knell for rump theatrical unions in Canada. U. S. legislators please take notice!

● A projectionist member of the I. A. now serving with the armed forces writes us as follows:

"Our industry will be greatly influenced by television when the war is over, and the boys back home had better get busy and brush up on their technical stuff or else they will find themselves behind the well-known 8-ball when the shooting is over. Thousands of men now serving as motion picture projectionists with the armed forces will be looking for work in this field when they return to civilian life, and the competition for jobs will be terrific. Local unions must continue with their educational activities so that our men will not be caught short when television finally is unwrapped."

Yes, siree, we are of the same opinion.

● The members of Local No. 590, Greenwood, Miss., have offered to produce a series of comedy shorts (all expenses involved to be borne by them) which they will donate to the various army camps. So far army red tape has prevented the local from putting this plan in operation, but permission to go ahead with this grand idea is confidently expected. Swell idea, boys, maybe some of the other locals will follow suit.

● There are approximately 1500 I. A. members residing in Queens County, N. Y., and we direct their attention to this particular item. Representative William B. Barry, of Queens County, has proven himself a friend of labor in his determined opposition to all anti-labor bills brought before Congress. In this era of labor-baiting legislators, it is the duty of every union man to support only those public officials who have *proven* themselves to be friends of organized labor, and Rep. Barry is one of them.

● Aaron Nadell, former editor of this publication and erstwhile corporal in the United States Army, is now serving as a radio operator with the merchant marine. He found army life too dull, it seems, and the call of the "old debbil" sea got him. He asked for and obtained a transfer to the more dangerous branch of the service. Well, Aaron, we hope you find the adventure you were searching for, and you have our very best wishes for a safe return home.

● In a recent statement, Allen G. Smith, chief of the amusements section of the War Production Board, said "Theatre losses due to fires increased *400%* in the last four months over the previous four months, and the losses are due mainly to INEXPERIENCED OPERATORS." Coming from a man with Smith's experience in the theatre field, this statement should have far-reaching effects. We suggest that a charge of sabotage be made against the exhibitor who disregards the lives of the public, and the safety of valuable property and equipment by employing inexperienced projectionists, who have neither the training nor the ability to handle projection room equipment.

● J. Leonard Trowbridge, member of Local No. 595, Carthage, Mo., was recently killed in a plane accident while flying over Kentucky testing a new type plane for the Curtiss-Wright Corporation.

● Perhaps by the time this issue goes to press the United Mine Workers will have effected its merger with the A. F. of L. The application for membership has been filed by John L. Lewis, head of the U. M. W., and an "investigating committee" has been appointed.

It is high time that there was an end to all strife between the various labor organizations. The best interests of all would be served by ONE unified labor movement—one for all and all for one. "Divide and conquer" is the underlying theme of our enemies' war campaign, and "divide and conquer" is the slogan of the publicity-seeking labor baiters holding public office.

"*Capital is only the fruit of labor, and could never have existed if labor had not first existed. Labor is the superior of capital, and deserves much the higher consideration.*" These words, spoken by Abraham Lincoln many years ago, are just as true today as they were then.

● After considerable research, it has been discovered in Great Britain that ventilation properly applied increased production from 6 to 15%. The United States Public Health Service announced that 12 to 64% of anthracite miners, exposed to uncontrolled dust, soon showed a lowered work capacity. Dust is dust, whether it is in the mines or in the projection room. If the work capacity of one group is lowered due to improper ventilation, the same effect will be produced upon another group working under similar conditions.

We all know that the projection room is the dust collector of the entire theatre, and the projectionist is constantly exposed to the danger of breathing dust-filled air. Have you noticed how groggy you feel the last few hours on your shift, and how once you hit the street a bit of fresh air revives you? That groggy feeling is caused by the impure dust-laden air you breathe in the projection room, and which, in time, will bring on silicosis and eventually asthma (sinus).

A well ventilated projection room will eliminate this danger. Although ventilating machinery requires a high priority these days, it can be obtained, so don't let the exhibitor give you a song-and-dance spiel about his inability to obtain the necessary equipment. Our district associations should take this matter up with their various State Federations and make every effort to protect the health and well-being of their members.

● Because the two exit doors of the Shelmar Theatre in Louisville, Ky., were barred while the theatre was so crowded that people were standing in the aisles, S. F. Thompson, theatre manager, was hailed to court by a fire inspector and was let off with a $15 fine. A monetary

fine will never teach these people that they MUST comply with fire regulations and safeguard the lives of their patrons and employees—it will take a more drastic form of punishment to make them wake up.

● Several months ago we published in these columns a resolution passed by Local No. 171, Pittsburgh, Penna., pertaining to the freezing of applications and positions during the national emergency. This resolution was designed to protect the rights and privileges of those members who are serving with the armed forces. Through the courtesy of Luther W. Thompson, secretary of the local, we are appending hereto the rules governing the aforementioned resolution:

1. Nothing in these recommendations shall be construed to conflict with the provisions of the Seniority Laws.

2. Members in vital war industry shall pay the usual $2.00 per month dues.

3. Members returning from the war effort shall return to their original positions immediately.

4. All members whose position has been affected by this resolution shall return to the position held by them as of January 21, 1943.

5. The move back to original positions shall be made as members return from the war effort.

6. The Business Manager shall purchase or have printed a suitable ledger.

7. All relief jobs issued temporarily, or broken up, shall be reassembled and posted for bid, after the emergency.

8. Members covering relief jobs shall not be permitted to resign any one part of said relief jobs, unless he resigns the entire relief jobs.

9. During the period of this emergency all positions shall be distributed in the usual manner, according to the Seniority Laws.

10. The members in regular meeting assembled, shall decree when the emergency has terminated.

11. When the emergency is declared terminated by this Union, all positions distributed during the emergency shall be posted on the bulletin board for the purpose of receiving bids.

12. The membership shall be notified by mail that all the temporary jobs are posted on the bulletin board for the members to bid on.

13. The acceptance or rejection of the temporary jobs shall take place at a special meeting called for that purpose.

14. The Board of Trustees shall secure a suitable meeting hall equipped with a 'phone and a large blackboard.

15. The absence of a bidder from this meeting shall be accepted as his declination of all jobs.

16. In the event of sickness a bidder may designate his preference of jobs in writing.

17. The jobs shall be bid on according to the weekly salary, with the highest weekly salary first, and the lowest weekly salary last.

18. Members of affiliated organizations shall be given considered preference in extra work and in temporary War Cards.

19. The membership shall be polled by mail to secure volunteers, to cover jobs steady for the duration in addition to their steady jobs.

20. When the emergency is terminated, applications for membership shall be considered from the applications on the files of this Union. Consideration shall be given new applications from men, returning from the war effort.

21. In distributing Extra Work, preference shall be given to members of Local 171.

22. It is recommended that a copy of the Resolution and Rules of the Resolution be mailed to every member in the war effort.

23. All jobs that have not been bid on, shall be distributed by the Business Representative, for the best interests of the Union, SUBJECT to the approval of the Executive Board and the next regular meeting.

● First Lt. Merle Chamberlin, member of Local No. 165, Hollywood, Calif., and chief projectionist at the M-G-M studios, was our guest at a recent meeting of Local No. 306. Merle's brief address to the members was enthusiastically applauded and he was urged by many of those present to make a return visit. He is now stationed at the Long Island studio of the Signal Corps and we hope to see quite a bit of him while he is in these parts.

● Red Rupard, Local No. 249. Dallas, Texas, made the discovery that by burning two 8mm carbons, one positive and one negative, he not only saves 40% of the light bill, but also gets a better light on the screen. On a recent visit to the Melba Theatre, where he is employed, Red demonstrated this idea to us, and his fellow workers in the projection room endorse it 100%. He guarantees to run a 2000-foot reel on a one-inch stub and hold the gas ball perfectly. Any comments?

● In the last issue of I. P. we reported that Local No. 306 voted almost unanimously to absorb the Empire State Union (rival projectionist union) and grant its members full membership in 306. This merger, however, was prevented from becoming an accomplished fact by the Century Circuit, who control a number of theatres in Greater New York, and who obtained a temporary injunction against the proposed merger. As we stated last month, exhibitors prefer the existence of two or more rival unions, so that they might successfully play one organization against the other during wage scale negotiations.

History has a way of repeating itself. When we were president of Local 306 about a decade ago, we took steps to bring about the amalgamation of Local 306 and the Empire State Union. At that time, ten years ago, an injunction was obtained by exhibitor interests to prevent the completion of the merger. Today, however, neither Local 306 nor the Empire State Union will permit this temporary setback to defeat their purpose and will fight the matter in the courts.

Despite the federal and state laws that permit a man to choose his union, the exhibitor interests seem to be able to flout these laws and dictate to which union their employees may belong. Thinking out loud we wonder, "Does the answer lie in the fact that certain politicians are stockholders in motion picture theatre circuits, and that they use their political influence to sway court opinion in rendering decisions favorable to these circuits?" We don't know the answer yet, but we purpose finding out before long.

● Condolences to our very good friend, Vic Cuneo, electrician at the Stanley Theatre in Pittsburgh, Penna., on his recent bereavement. His wife, Kitty, died after a short illness and her passing was a shock to their many friends.

● Gordon Barnes, member of Local No. 738, Allegan, Mich., who was reported missing several months ago by the U. S. Naval Air Corps., recently turned up in his home town very much alive. This good news was passed on to us by George H. Westenfeld, Local No. 395, Ann Arbor, Mich.

● C. Wesley Kent, New York inspector for Altec Service, hit the jack pot once more. This time it was another son—Gary Winston.

● Two smart boys who are looking ahead and planning for the days when the industry will be permitted to take the wraps off the many wonderful advances made in the art of projection and television are W. Meany and A. J. Seeley, members of Local No. 376, Syracuse, N. Y. Messrs. Meany and Seeley have just completed a course on radio at the University of Syracuse, which they have attended for the past two years, and are now taking up the study of electronics. We understand that these courses are sponsored by Uncle Sam and are open to all applicants. The only expense to the students is the small outlay for the necessary books.

● Sgt. W. E. Limmroth, of the Signal Corps Radio Maintenance and Repair, stationed at Indiantown Gap, Penna., was a visitor to the projection room of the Paramount Theatre in New York City. In his civilian days Limmroth was employed as projectionist at the Ritz Theatre in Sweetwater, Texas, and unlike most Texans, he thinks our fair city is quite the berries.

● Among the projectionists who attended the technical sessions of the recent S. M. P. E. convention were

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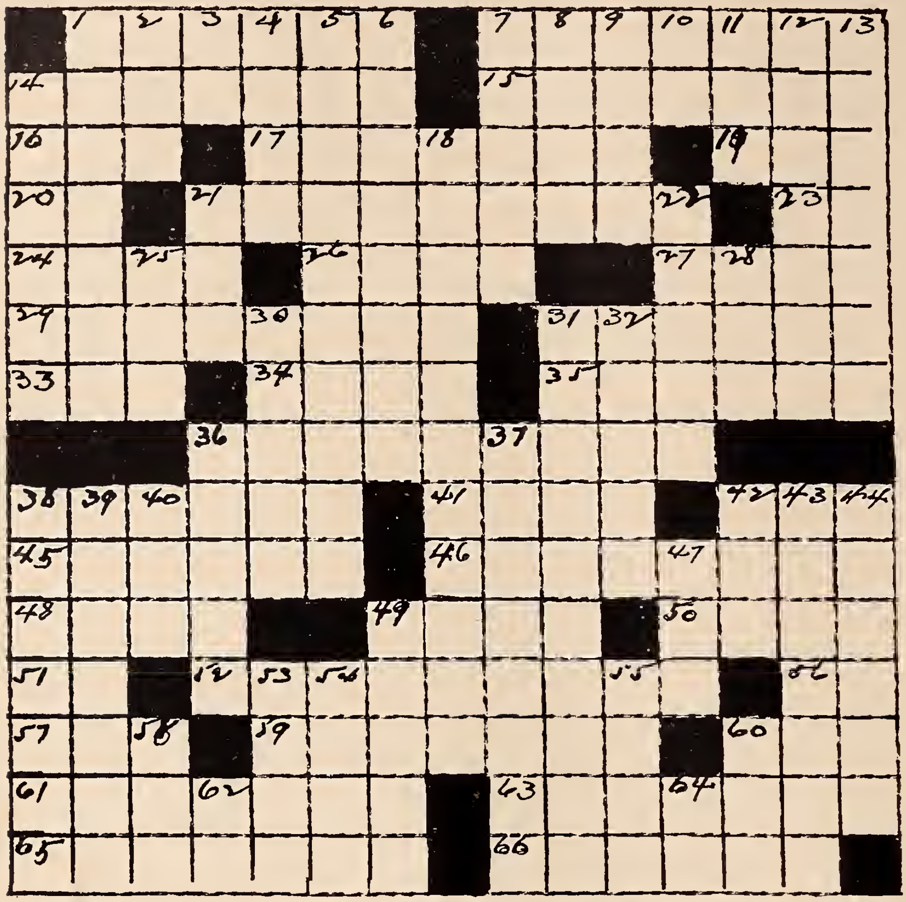
Novel Crossword Puzzle Contest Will Carry War Stamps to Winners



DOWN

1. Telephone Exchange
2. Mimic
3. Baronet (Abbr.)
4. Fail
5. Newspaper views
6. Rectifier
7. Marks
8. Woven metal screen
9. Ditch (Eng. dial. Var.)
10. Plural ending
11. Suffix (chem.)
12. Variations (mus.)
13. Bohemian composer (1924-84)
14. Mohammedan sacred places
18. From across the sea
21. Dead (obs.)
22. Troy was its capital
25. Plank curve
28. Prov. in Japan
30. Smarter
31. Gaseous tube
32. Benzene
36. Daub
37. Destroys (obs.)
38. Part of tube
39. Neighbor (Scot)
40. Quick
42. And so forth
43. Chopped up again (var.)
44. Loves
47. Headed
49. Fake (U. S. Slang, var.)
53. Official garment for priest (ref. sp.)
54. Establish (ref. sp.)
55. Highest note in scale
58. Indian
60. Combining form for ethyl
62. Power loss
64. Index correction (abhr.)

ACROSS

1. Conductors
7. Part of tube
14. Part of tube
15. Photoelectric cell
16. Suffix (chem.)
17. Mass of silt
19. No (Scot.)
20. Right (abbr.)
21. Restraining through fear
23. Niton (abhr.)
24. Irish
26. Indians of Tierra del Fuego
27. Fool (Bib.)
29. Chinese bureaucrat
31. Said
33. Sneaky
34. Masc. proper name (It.)
35. Daughter of Simonides
36. Stuttered
38. Transformer material
41. Straightway
42. Age
45. Attenuation constants
46. Belted again
48. Mountain sickness
49. Snap of the fingers
50. Reflected sound wave
51. Epistle (abbr.)
52. Vibrated
56. Aromatic (abbr.)
57. Card game
59. Window (Fr.)
60. Inhabitant (suffix)
61. Defeat by a majority
63. Ancient stone implements
65. With pride
66. Seized suddenly (ref. sp.)

I. P.'s Crossword Puzzle Contest, starting this month, it is sincerely hoped will prove as interesting and entertaining to our readers as did the Technical Contest, the final details of which appear elsewhere in this issue. The latter contest brought in a large number of answers each month from working projectionists who showed they have the stuff to carry on during the emergency period. Technicians who read the answers generally expressed frank amazement at the knowledge, skill and initiativeness of the contestants and in the manner in which the problems were solved.

In the Crossword Puzzle Contest there will be need of the same attributes, and perhaps additional ones, for our Crossword is not one that may be solved by the average Crossword Puzzle fan. A knowledge of terms used in your work is highly essential, for while you will find some simple definitions that will bring the answers instantly to mind there are others that will call for considerable use of your thinking apparatus.

And then there are some good words in the English language that have been inserted—all found in dictionaries—but which are not in general every-day use. The editors of I.P. carefully prepared the puzzle with the idea in mind that its solving would mean entertainment and also have practical results.

Ten prizes—each a $2.00 award of War Savings Stamps—will be given each month to those contestants who send in the correct answers *together with a letter not to exceed* 100 *words on a topical question that will be asked each month.* Literary skill is not required to win a prize. The awards will be based on the most original ideas set forth, and the practicality of the idea or ideas. Winners will be chosen by the editors of I.P., and their decisions will be final. In case of ties, duplicate prizes will be given.

When you have completed the Crossword Puzzle this month, write your letter answering the following question, and mail both to the Contest Editor, International Projectionist, 19 West 44th Street, New York, N. Y., postmarked not later than July 1, 1943.

June Contest Question

"How Have You Helped in the Government's War Conservation Program?"

THE AWARDS

Ten prizes of $2.00 in War Savings Stamps.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random; fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Emergency Supply for W. E. Systems Using KS-5259 Motor Generator

In all of my theatres using the ERPI KS-5259 motor generator to supply power for the sound systems, it has been found a simple matter to supply the necessary voltages from the arc generator. On the systems using the arc generator to supply the field as originally wired, batteries were used to supply the exciter lamps and d.c. filaments, as no filters were provided in the systems. However, where the KS-5259 is used, all circuits are filtered and the entire system can be operated from the arc generator.

A double-pole double-throw switch and a suitable resistor is all that is necessary to prevent a long and costly shutdown, especially since it is difficult to procure the necessary three 6-volt storage batteries required to pinch hit for the generator. The center terminals of the double-pole double-throw switch are connected directly to the 18-volt filter terminals. The output of the KS-5259 motor generator is connected to one set of the double-pole double-throw switch terminals and the other set of terminals is connected to the output of the arc generator, through a suitable resistor.

For example, let us assume that the arc generator delivers 80 volts to the ballast with two exciter lamps drawing 4½ amperes maximum, two 555 *W* receivers in series, and 750 mils to the d.c. tubes. Ohms law is used to calculate the value of the resistor. If the exciters draw a total of 9 amperes, the receivers 1½ amperes, and the tubes approximately 1 ampere, this gives us 11½ amperes total current. Since the arc generator output is 80 volts and the KS-5259 motor generator is 18 volts, the difference between the arc generator output and the KS-5259 motor generator is 62 volts. Then 62 divided by 11.5 amperes equals approximately 5½ ohms. Dissipating the 62 volts at 11½ amperes, the wattage is 311 watts. An old type ballast rheostat or, better still, a heavy-duty dimmer, will do the trick.—N. D. Owens, *RCA.*

Protecting Equipment

When it is necessary to file a part or drill a hole in a part of the machine or amplifier cabinet where the falling shavings or filings may create serious trouble, it has been found expedient to place a cloth or sheet of paper cut to convenient size below the portion being worked on and fasten the edges of the cloth or paper to the sides of the amplifier case or machine with Scotch tape. In many cases this can be done in such a manner as to eliminate any possibility of not catching all of the filings.—C. D. Welch, *RCA.*

Repairing 712-A Drive Oil Seals

If oil seals still leak after new seals have seen installed, trouble is due to grooved gear hub. The seal can be made leakproof by following these directions: Wrap a piece of stranded wire at least twice around seal, with seal mounted on gear hub. Twist the ends of the wire up tight and then over flat to permit the assembly of sleeve. The new seal will then be forced into the hub groove and will be leakproof.—D. Waddell, *RCA.*

Conservation of Fuses

In testing defective amplifiers, power units, and other similar components, I use a heater unit in place of a fuse. In this way voltage and current tests can be made without blowing a fuse. After the trouble is cleared, the heater unit is removed and the unit fused in the regular manner.—R. H. Bisbee, *RCA.*

Conservation of Carbons and Power

The conservation of carbons and power by the simple method of reducing arc amperage is to be commended but it creates too many difficulties that are hard to understand. One serious difficulty is the formation of a brownish red tip on the end of the negative carbon. Since this is a good electrical insulator, it makes it impossible to strike an arc. The application of a drop of water to the tip of the carbon before striking the arc can easily overcome this situation.

Then again we run into discoloration at the screen, which is the direct result of operating lamps at currents lower than those for which they were designed. The proper action of the arc depends upon a tiny gas flame just at the tip of the positive carbon. This flame is fed by a flow of gas generated in the carbon and will retain its stable position only as long as the current remains constant. If the current is lowered to the point where there is insufficient heat to generate a steady flow of gas, puffs of gas will come intermittently and destroy the white gas ball or alter its position. Once this white gas ball is lost it cannot, of course, he reflected by the mirror, but the yellow of the carbon itself will be reflected instead. With the next puff of gas the white gas ball will return to the end of the carbon. This action will cause some of the blue of the arc stream to be drawn into focal range, and accounts for the different colors—white, yellow, blue, and back again to white. This second condition may be caused either by too low amperage or by excessive draft through the lamp house.—Hal Prosser, *RCA.*

Health Precaution

Both the location of speakers and the dust behind the screen in most theatres form a real health menace during routine inspection and emergency work. As for the first, extreme care must be exercised by the engineer; while for the dust menace, I find that a fibre paper mask, which may be obtained at most drug stores (three for twenty-five cents), makes conditions tolerable for the half hour or so spent behind the screen.—David Moses, *RCA.*

Operating Defective Projector in an Emergency

Often times it is necessary to operate on one machine simply because the other machine is waiting for a replacement gear. I have recently had two instances where the defective machine was kept in operation for several hours by using the following expedient:

The machine is turned in the direction of rotation and the stripped gear is meshed so that it will have a chance to make one complete revolution on the start, and allow the momentum of the mechanism to carry it over the stripped portion. Naturally, such operation is an emergency measure only, but may prove useful in saving the show for a short period of time until such gears can be replaced.—J. A. Day, *ALTEC.*

Repairing 712-A Drive Oil Seals

If oil seals still leak after new seals have been installed, then the trouble is due to a grooved gear hub. The seal can be made leakproof by the following procedure: wrap a piece of stranded wire

(*Continued on page* 20)

16- VS. 35-MM PROJECTION

(*Continued from page 8*)

and school officials, among the twelve million, who will leave the army with the firm conviction that the type of 16-mm picture used in their own training is an indispensable necessity in their future educational activities.

It is noteworthy also that only one projector is used in the army's 16-mm showings, while two projectors with well-managed changeovers present the 35-mm programs, yet even the interruption while reels are changed does not completely damn 16-mm entertainment in the eyes of soldiers. Perhaps the WAACS will prove more critical.

Projectionist Training

Although army projectionists are not very thoroughly trained, according to civilian standards, they do put the show on, and keep it running, and will no doubt consider themselves competent projectionists when they return to civilian life. Additionally, there are large numbers of soldiers who handle only 16-mm equipment, but who doubtless will feel confident that they are at least part way along to the point of being able to deal with 35-mm projection also.

Additionally, the army is training multitudes of men in radio—many more than there is much chance of the radio industry being able to absorb when the war ends. These men are getting a good ground-work in the fundamentals of electricity, in the action of rectifying and amplifying tubes, and the circuits of amplifiers. The overflow left unemployed by the radio industry may very possibly consider that they, also, have had a good start toward full-fledged projection skill. This will be especially true of those of them who have been called on casually, with very little extra instruction, to fill in a shortage in the projection staff of their camp or post. And these men actually are, as a matter of simple fact, partly trained for projection work in the sense that they are trained in many of the electrical fundamentals of theatre apparatus. Professional projectionists, if they are to keep ahead, may find it advisable to improve their own training beyond standards hitherto considered acceptable.

Not only radio trainees, but the army's large staff devoted to telephone installation and maintenance, are taught basic electricity, rectifiers, and (in some cases) amplifiers. The air corps also, and the soldiers dealing with special detection devices, are instructed along these lines. In addition, they all see 16-mm projectors handled openly and casually in their class-rooms and recreation halls; and they have ample opportunity to observe the threading and manipulation of 16-mm

film. if they are at all interested. Many of them, if faced with post-war unemployment, may decide it is not a very much longer step to handling 35-mm film also.

A possible expansion of the 16-mm field side by side with, and in addition to, the existing industry, would doubtless take care of the employment demands of many such veterans; but for the same reason a possible post-war expansion of 16-mm projection may provide fewer opportunities for present-day projectionists than might be imagined—former soldiers moderately capable of undertaking the work will be available.

Surplus Equipment

After the last war, huge quantities of technical equipment were turned over to the second-hand market by the armed forces. There was not so much projection equipment—projection was not used then for training or for recreation, to anything like the extent it is today. But there was an immense amount of radio apparatus, for example; so much that the second-hand stores were glutted with it for years, and some of it can still be found today, battered and obsolete, if one cares to look for it.

What will happen after this war—how large a standing army will be maintained—what the policy will be with respect to used equipment, of course remains to be seen. But certainly no standing army in days of peace will be anything like as large as that in service now, or need anything like the same quantity of 16- and 35-mm equipment. If the surplus were to be sold off, the 16-mm apparatus might help give an enlarged 16-mm industry a flying start, just as in 1919 the army's old radio equipment helped give the infant radio industry a start. The surplus 35-mm apparatus, on the other hand, might possibly act as a brake, by reason of its cheapness, on those technical improvements in 35-mm projection which even today are very visibly in the offing. But there is not so much 35-mm equipment as there is of the 16-mm type, and the upshot may very possibly prove to be an expanded 16-mm industry, with 35-mm keeping it in its place by drastic and dramatic improvements over anything known in the theatre today.

ARMY CAMP THEATRES GROSS $16,520,000 IN 1942

Army camp theatres operated by the United States Army Motion Picture Service are indicated to have grossed $16,520,000 during 1942, according to MPPDA. The Service's 840 theatres in camps and bases in the United States, Alaska and the Caribbean, the review reports, drew a total attendance of 118,000,000 service men at an admission charge of 14 cents. The theatres have a total seating capacity of 543,576, with profits being turned over to camp mess funds.

AT YOUR SERVICE

(*Continued from page* 17)

at least twice around seal, with seal mounted on gear hub. Twist the ends of the wire up tight and then over flat to permit the assembly of sleeve. The new seal will then be forced into the hub groove and will be leakproof.—DAVE WADDELL, *RCA*.

How to Rectify Loss of the Lower Soundhead Loop

A complaint of losing the lower soundhead loop due to play in the lower pad roller bracket was corrected in the following manner: The section of the hole in the adjusting plate into which the ball bearing of the arm rests showed little or no wear, but there was too much play between the arm and the plate. Therefore, a thin shim was placed back of the plate to bring it out fairly tight against the arm.—C. E. WELCH, *RCA*.

Emergency Operation of Projector

Some time ago one of my theatres called and advised me that the lower take-up sprocket shaft gear had been stripped. Since a replacement was not immediately available, I suggested that the teeth of the stripped gear be completely ground off so that they would not interfere with the operation of the gear that drove the defective one. These instructions were carried out and, using the lower take-up sprocket as an idler, the show continued.—E. M. KARCHER, *RCA*.

Correcting Oscillation in PG-142A Systems

A recent case of high frequency oscillation in the monitor amplifier of a PG-142A system was encountered. Replacement of the 991 Radiotron corrected the trouble.—H. H. QUACKENBUSH, *RCA*.

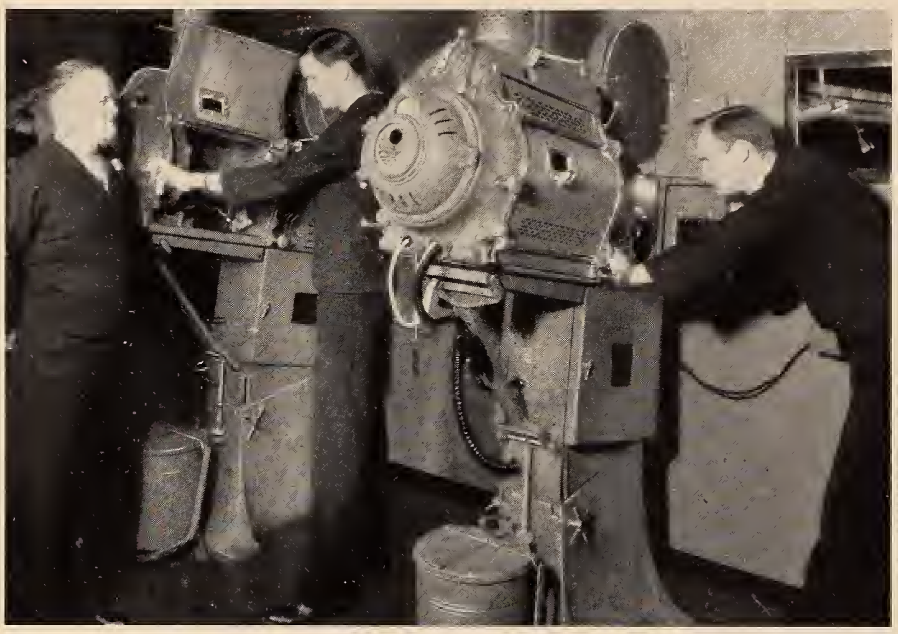
Conservation of Sprocket Shafts

While most projectionists are no doubt familiar with the following suggestions, it may be well to mention them again now that parts and materials are becoming difficult to replace. The suggestions concern a circumstance that happens but rarely these days, namely, bent shafts, or to be more specific, bent sprocket shafts on 707 drives. Yet recently I have had to straighten out two such shafts, making replacements unnecessary. The suggestions provide a means of saving material as well as time and expense involved in replacements.

Most projectionists, I believe, can find a rod of some stiff metal approximately ¾" cross-section in which axial holes can be drilled to fit the several shaft sizes commonly used. As practically all bent shafts I have encountered were bent at the outer bearing shoulder, straightening them was a simple matter. The procedure is to determine the direction of the bend and then to slip the drilled bending rod over the shaft and bend in the direction indicated to cancel the bend-out. Several attempts may be necessary as successive indicator measurements are made until the shaft diameter is not out more than .0005", or so.

If one has no indicator available, equally good results may be obtained by using a toothpick, stiff straw, knitting needle, etc. Although the mechanical arrangement may not always be the same, the idea is sound. By observing the vertical travel of the extreme end of the stick and then dividing this measurement by the ratio of the two stick-sections, the shaft eccentricity can be quite accurately determined. However, our main interest is indication or direction of eccentricity rather than its magnitude generally, and for this purpose the small stick does the job admirably.

To use a stick or small knitting needle, one end of the needle should be fastened to a small wooden block which is attached to the mechanism to be checked. The stick or needle is then laid on top of the sprocket or shaft with the longer end extending, and is used as an indicator for the movement caused by the eccentricity of the shaft. Thus, a small movement of the eccentric sprocket or shaft will cause a magnified movement at the end of the needle or stick.—FRED S. KAKEWITZ, *RCA*.



Underwriters Code As It Affects Projection Rooms

VIII

2593. *Direct-Current Circuits.* The carrying capacity of the grounding conductor for a direct-current supply system shall be not less than that of the largest conductor supplied by the system and in no case less than that of No. 8 copper.

2594. *Alternating-Current Circuits and Service Equipment.* The size of the grounding conductor for an alternating-current system, a common grounding conductor, or a grounding conductor for service equipment shall be not less than given in the following table, except that where connected to artificial electrodes as described in sub-paragraph d of section 2582, the grounding conductor need not be larger than No. 6 copper or its equivalent:

Size of Largest Service Conductor	Size of Grounding Conductor: Copper Wire No.	Conduit or Pipe (Inch)	Electrical Metallic Tubing (Inch)
2 or smaller	8	½	½
1 or 0	6	½	1
00 or 000	4	¾	1¼
Over 000 to 350,000 C.M.	2	¾	1¼
Over 350,000 to 600,000 C.M.	0	1	2
Over 600,000 to 1,100,000 C.M.	00	1	2
Over 1,100,000 C.M.	000	1	2

Conduit, pipe, or electrical metallic tubing cannot be used alone as the grounding conductor for a wiring system. See paragraph a of section 2591.

2595. *Interior Raceway and Equipment.* The size of the grounding conductor for conduit, cable sheath or armor, and other metal raceways or enclosures for conductors, and for equipment, shall be not less than given in the following table, except that where connected to artificial electrodes as described in sub-paragraph d of section 2582, the grounding conductor need not be larger than No. 6 copper or its equivalent:

Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc., Not Exceeding (Amperes)	Size of Grounding Conductor: Copper Wire No.	Conduit or Pipe (Inch)	Electrical Metallic Tubing (Inch)
30	14	½	½
60	10	½	½
100	8	½	½
200	6	½	1
400	4	¾	1¼
600	2	¾	1¼
800	0	1	2
1000	00	1	2
1200	000	1	2

2596. *Portable and Pendent Equipment.* For grounding portable or pendent equipment, the conductors of which are protected by fuses or circuit-breakers rated or set at not exceeding 15 amperes, No. 18 copper wire may be used. For grounding portable or pendent equipment protected at more than 15 amperes, the table in paragraph 2595 shall be followed.

2597. *Outline Lighting.* Isolated non-current-carrying metal parts of outline lighting systems may be bonded together by a No. 14 conductor protected from mechanical injury, if a conductor complying with section 2595 is used to ground the group.

2598. *Common Raceway.* A grounding conductor may be run in the same metal raceway with other conductors of the system to which it is connected.

2599. *Continuity.* No automatic cutout or switch shall be placed in the grounding conductor of an interior wiring system unless the opening of the cutout or switch disconnects all sources of energy.

Grounding Conductor Connections

2611. *Grounding Conductor to Raceway.* The point of connection of the grounding conductor to interior metal raceways, cable armor and the like shall be as near as practicable to the source of supply and shall be so chosen that no raceway or cable armor is grounded through a run of smaller size than is called for in section 2595.

2612. *Grounding Conductor to Elec-*

(Continued on page 25)

I. P. CONTEST

(Continued from page 13)

tremely annoying trouble in a sound system and it has no respect for the type of system, be it old, new, or in-between. We repeat that there is no set rule for clearing such trouble. By experience a clue can be obtained from the type of noise, but even this will lead the most experienced astray at times. An open mind and careful analysis of the circuits involved seems to be the best method of attack.

We can say that the first steps always involve localizing the trouble. Determine whether it is in one or both machines. In those systems which have a common plate supply paralleled at the voltage amplifiers, noise in one machine may be reflected to the other. A headset is always very helpful in locating such trouble. We hoped that this question would make those projectionists, who have not encountered this trouble, aware of the possibility of its occurring and that they would plan a method of attack which would minimize the show outage time. Some of these troubles take a fair length of time to cure even though the best methods are applied, so advance planning is of the utmost importance.

We have had difficulty each month in selecting the winners of the prizes, but when it came to the awarding of the grand prize we really had one heck of a time. There were so many who had turned in consistently excellent answers that the careful weighing of all answers from each of the contestants was a real problem. We gradually reduced the pile, after careful consideration of the detailed information furnished, the ingenuity of the solutions, their practicability and method of attack.

In accordance with the announcement carried elsewhere in this issue we extend our heartiest congratulations to H. D. Taylor as the winner of the Grand Award. May he continue to prosper in future contests. And to the other contestants, a slight shift in the wind would have brought one of you home first. We can state emphatically that none of you were as much as a length behind. It was a close race from the beginning and even closer on the final leg.

You write us that this contest has been very interesting and educational to you. It has also been all of that to us, and we have been exposed to this business for quite a number of years now. Still we learned of new tricks, which have been passed along to you to add to your bag of tricks.

Now we pass on to a new technical contest, details of which will be announced in a forthcoming issue, and which we hope you will find as interesting and as instructive as the one to which we now write *finis*.

JOHN K. HILLIARD NOW WITH ALTEC LANSING

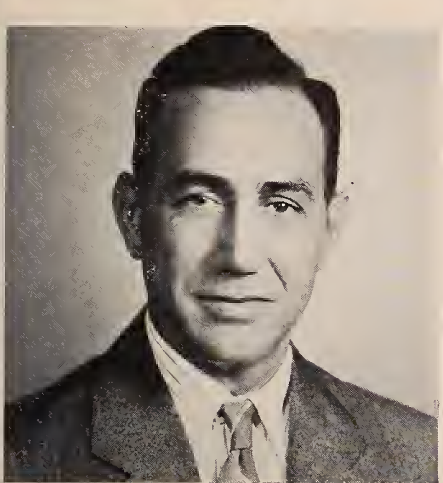
John K. Hilliard, chief transmission engineer of the M-G-M sound department, recently consultant to the Radiation Laboratories of Massachusetts Institute of Technology, has joined the war production staff of Altec Lansing Corporation, Los Angeles, as chief engineer of the Radar and Motion Picture Division.

Hilliard is chairman of the Theatre Standards Committee of the Research Council of the Academy of Motion Picture Arts and Sciences, a member of the Motion Picture Standards Committee of the Royal Scientific Society of Great Britain, and is the author of many publications on technical subjects in the communications and motion picture fields.

DATA ON ACOUSTIC DESIGN CHARTS NOW OFF THE PRESS

"Acoustic Design Charts," by Frank Massa, B.S., M.Sc., in Charge of the Acoustic Division, the Brush Development Co., Cleveland, Ohio, is a 228-page work, containing 107 full-page charts. The book presents comprehensive acoustic engineering data for use in the construction or design of electro-acoustic apparatus, and converts basic acoustic theory into practical charts of quantitative value which may be used without laborious computations and interpretations. The material is divided into ten sections, each with an individual table of contents. Publishers are the Blakiston Co., Philadelphia, Penna.

Unionism and Projection are Twin Hobbies of Grand Prize Winner



H. D. TAYLOR, of Raleigh, N. C., winner of the Grand Prize in the I.P. contest, as well as several of the monthly awards, writes: "I am in receipt of your letter informing me of having been awarded the Grand Prize in your contest of 'Skill and Wits,' and I wish to thank you many times over for this and the many other valuable prizes received from your during the contest."

Despite his cleverness Mr. Taylor is a modest man, as those who know him will attest. He is a practical "old-timer" in this business, having "started trying to be a projectionist," as he says, over twenty-five years ago, when he stood on a box to reach the crank of a Powers No. 6 machine, and he has continued to be "sold" on the idea.

Imbued with the idea of the need of unionism for projectionists he organized Local No. 670, Goldsboro-Wilson, N. C., in 1929, transferring his membership to Local No. 603, Raleigh, N. C., in 1933. He has been a hard and persistent worker in the cause of unionism and in advancing the art of projection. They are his twin hobbies and his chief interests. He says that he has been trying to learn the finer points of sound reproduction since 1928, a fact which was graphically brought out in his month-to-month interest in the contest.

When he cranked that old Powers machine he was just 16 years old, for his age now is 41. He is married and the father of three sons, the oldest being a member of the United States Naval Reserves, soon to start his training to qualify for a commission in the Navy's air-force.

Like all those who are in love with their work, Mr. Taylor emphasizes that he spent many pleasurable hours during the contest in solving, in his own way, the problems presented. They were happy hours, well spent, he asserts, bringing to him many benefits. We may add that his contributions also brought benefits to many others with similar interests.

INTRODUCE BURN OINTMENT

Bio-Dyne, a new burn treatment, is now available for industrial and home use. The ointment brings to science another concept in wound healing, incorporating a newly discovered substance which is the result of over seven years' study of cellular growth and metabolism at a noted research institute. Ease of application is among the advantages of Bio-Dyne, with reputed almost immediate relief from pain. Manufacturers are Sperti, Inc., Cincinnati, Ohio.

● BUY WAR BONDS ●

IN THE SPOTLIGHT

(*Continued from page* 15)

First Lt. Merle Chamberlin, Local No. 165, Hollywood, Calif.; Jack Sawyer, Local No. 233, Buffalo, N. Y.; Thad Barrows, Local No. 182, Boston, Mass.; A. J. Seeley, Local No. 376, Syracuse, N. Y.; Joe Engel, Local No. 640, Nassau Co., N. Y.; Harry Rubin, Morris Kravitz and Harry Levine of Local 306, New York City and Max Munch.

Our good friend P. A. McGuire, advertising manager for International Projector Corp. was very much in evidence at these meetings and, as usual, played host to a number of boys from out of town.

● Marty Bennett, supervisor of projection for Warner Brothers, is touring the country visiting the many Warner theatres. Marty is very popular with his fellow workers and has loads of friends in the industry.

● Another popular visitor to the S. M. P. E. convention was A. J. Rademacher of Altec Service Corp. "Raddy" is very busy these days supervising projection room installations for the army and navy.

● In case of a fire in your projection room DON'T use your fire extinguisher. In the opinion of health authorities, carbon tetrachloride in the commercial form used in fire extinguishers, is a liquid which produces fumes by evaporation that are injurious to human health. Assuming that a projection room is well ventilated and that a small amount of film is burning, and that but a small amount of carbon tetrachloride is sprayed on the burning film, the projectionist using the extinguisher is subjecting himself to great personal risk. The poisonous fumes generated by the burning film, the evaporation of carbon tetrachloride, in addition to the other impurities in the air make the use of fire extinguishers in projection rooms a dangerous menace to the life and health of projection room personnel. For confirmation of the foregoing, consult the National Fire Underwriters!

● Jack Tobin, one of the old-timers of New York City Local No. 306, is a very modest and quiet spoken chap. However, he has good cause these days to puff his chest and swell with pride in the accomplishment of his son, Capt. Bernard M. Tobin, West Point graduate, who charted the weather forecasts for President Roosevelt's famous trip to Casablanca.

● We would like some comment from our readers on the cross word puzzle contest beginning with this issue. These puzzles are not only informative but they should prove a lot of fun. Here is a chance for cross word puzzle fans to brush up on their technical terms, in addition to the satisfaction of solving a puzzle for which there is a reward.

F. R. LACK AGAIN WITH W.E.; ELECTED OFFICER

Frederick R. Lack has been elected a vice-president of the Western Electric Co., following his return to the company after leaving to become director of the Army and Navy Electronics Procurement Agency at Washington. He has resumed his direction of W. E.'s Radio Division in New York.

Mr. Lack first became associated with Western Electric in August, 1911, as an assembler in the manufacturing department. After his return from France in 1919 he was assigned to development work on radio telephony and, as an outgrowth of this he supervised the installation of a radio telephone link between Peking and Tientsin.

He was in charge of vacuum tube development from 1935 to 1939, at which time he became manager of the company's Specialty Products Division. He directed the engineering of tubes for use on ultra-high frequency radio and for high power operations, which are fundamentals to the present manifold applications of radio in war operations.

UNDERWRITERS CODE

(*Continued from page* 21)

trode. The grounding connection to the electrode shall be located as follows:

a. To Water Pipes. System or common grounding conductors shall be attached to a water piping system on the street side of the water meter or on a cold water pipe of adequate current-carrying capacity as near as practicable to the water service entrance to the building. Where practicable, the point of attachment shall be accessible. If the point of attachment is not on the street side of the water meter, the water piping system shall be made electrically continuous by bonding together all parts between the attachment and the pipe entrance which are liable to become disconnected, as at meters and service unions. Equipment may be grounded to a cold water pipe near the equipment.

b. To Gas Pipes. The point of attachment of a grounding conductor to gas piping shall always be on the street side of the gas meter, and shall be accessible where practicable.

c. To Other Electrodes. The grounding conductor shall be attached to other electrodes permitted in section 2582 at a point which will assure a permanent ground. Where practicable the point of attachment shall be accessible.

2613. *Attachment to Circuits and Equipment.* The grounding conductor, bond, or bonding jumper shall be attached to circuits, conduits, cabinets, equipment, and the like, which are to be grounded, by means of suitable lugs, pressure connectors, clamps, or other approved means, except that connections which depend upon solder shall not be used.

2614. *Attachment to Electrodes.* The grounding conductor shall be attached to the grounding electrode by means of (1) an approved bolted clamp of cast bronze or brass or of plain or malleable cast iron, or (2) a pipe fitting, plug, or other approved device, screwed into the pipe or into the fitting, or (3) other equally substantial approved means. The grounding conductor shall be attached to the grounding fitting by means of suitable lugs, pressure connectors, clamps, or other approved means, except that connections which depend upon solder shall not be used. Not more than one conductor shall be connected to the grounding electrode by a single clamp or fitting, unless the clamp or fitting is of a type approved for such use.

2615. *Ground Clamps.* For the grounding conductor of a wiring system the sheet-metal-strap type of ground clamp is not considered adequate unless it has a rigid metal base seated on the water pipe or other electrode and the strap is of such material and dimensions that it is not liable to stretch during or after installation.

2616. *Protection of Attachment.* Ground clamps or other fittings, unless approved for general use without protection, shall be protected from ordinary mechanical injury (1) by being placed where they are not liable to be damaged or (2) by being enclosed in metal, wood, or equivalent protective covering.

2617. *Clean Surfaces.* If a non-conductive protective coating such as paint or enamel, is used on the equipment, conduit, couplings or fittings, such coating shall be removed from threads and other contact surfaces in order to insure a good electrical connection.

W. E. EQUIPS OVER 2,000 MILITARY CAMPS

In addition to producing an extensive list of special combat equipment ranging from radio telephones for airplanes, tanks, land stations and ships to secret equipment, W. E. has equipped more than 2,000 military camps, depots, airfields and arsenals while continuing to supply the essential needs of the Bell System.

Copper, a vital essential to electrical communications, has been reclaimed on a vast scale during the past year by Western Electric and its subsidiary, Nassau Smelting and Refining Company.

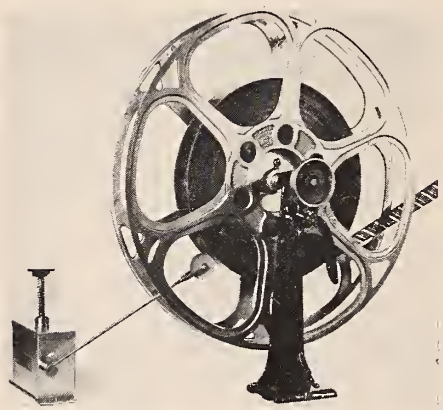
News in the Supply Field

NEW AUTOMATIC REWIND SWITCH BOON TO PROJECTIONISTS

A new and practical automatic rewind switch is being marketed by the Lakewood Automatic Switch Co., 1298 Hathaway Avenue, Lakewood, Ohio, the purpose of which is to save time and temper in the projection room.

The operation of this rewind switch is simple. Place the reel of film that is to be rewound on the rewind in the regular manner and press the button on the switch box. The roller arm rises to the film and the switch is automatically turned on. At a predetermined point the switch shuts off and the roller arm drops to the table, out of the way and ready for the next reel to be rewound.

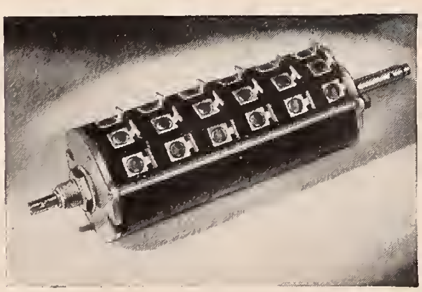
The roller arm is adjustable and can be set to turn off the switch at any predetermined point, thus preventing possible injury to the film leaders from slapping. The arm is made of soft rubber and rides on the glossy side of the film, and it cannot damage the emulsion since it does not come in contact with it.



This device was designed and perfected by J. Fried, member of Local No. 160, Cleveland, Ohio, a practical projectionist who is familiar with projection room problems. The switch can be installed in 15 minutes and requires no special handling—once installed, it needs no further attention.

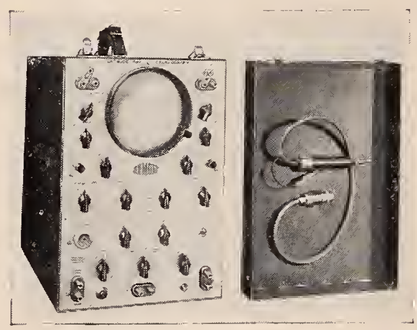
TANDEM CONTROL DEVICE

Clarostat Manufacturing Co., Inc.,, announces that a plurality of circuits, up to two dozen if desired, can be controlled by the single shaft of its new "42" Series Control, developed to meet certain radio and electronic requirements calling for the single control of several circuits. The new control was worked out to produce maximum rigidity in such tandem assemblies, as well as positive rotation of all units without the slightest backlash. Units with as many as 20 sections are being produced on order for critical applications.



NEW OSCILLOGRAPH HANDLES EXPANDED FREQUENCY RANGE

Distinguishing a new Type 241 Du Mont 5-inch cathode ray oscillograph from the 3-inch Type 224 are larger screen size together with the inclusion of a Z-axis amplifier to modulate the beam with any signal applied to its input terminals or with a return trace blanking impulse produced by the linear-time-base generator.



Developed and produced by the Allen B. Du Mont Laboratories, Inc., this oscillograph has a uniform Y-axis or vertical deflection response from 20 c.p.s. to 2 megacycles. It offers a comparably faithful square and sinusoidal wave response. The X-axis or horizontal deflection amplifier has a uniform characteristic from 10 c.p.s. to 100 kilocycles. Both amplifiers have distortionless input attenuators and gain controls, and provision is made to connect signals directly with the deflection plates when frequencies to be observed are beyond the useful limits of the amplifiers.

The instrument is self-contained, operating directly off 60-cycle 115-volt a.c. line, weighs 65 pounds and measures 17½ inches high, 10¾ inches wide, 21 inches deep.

THIRD DISTRICT MEETS

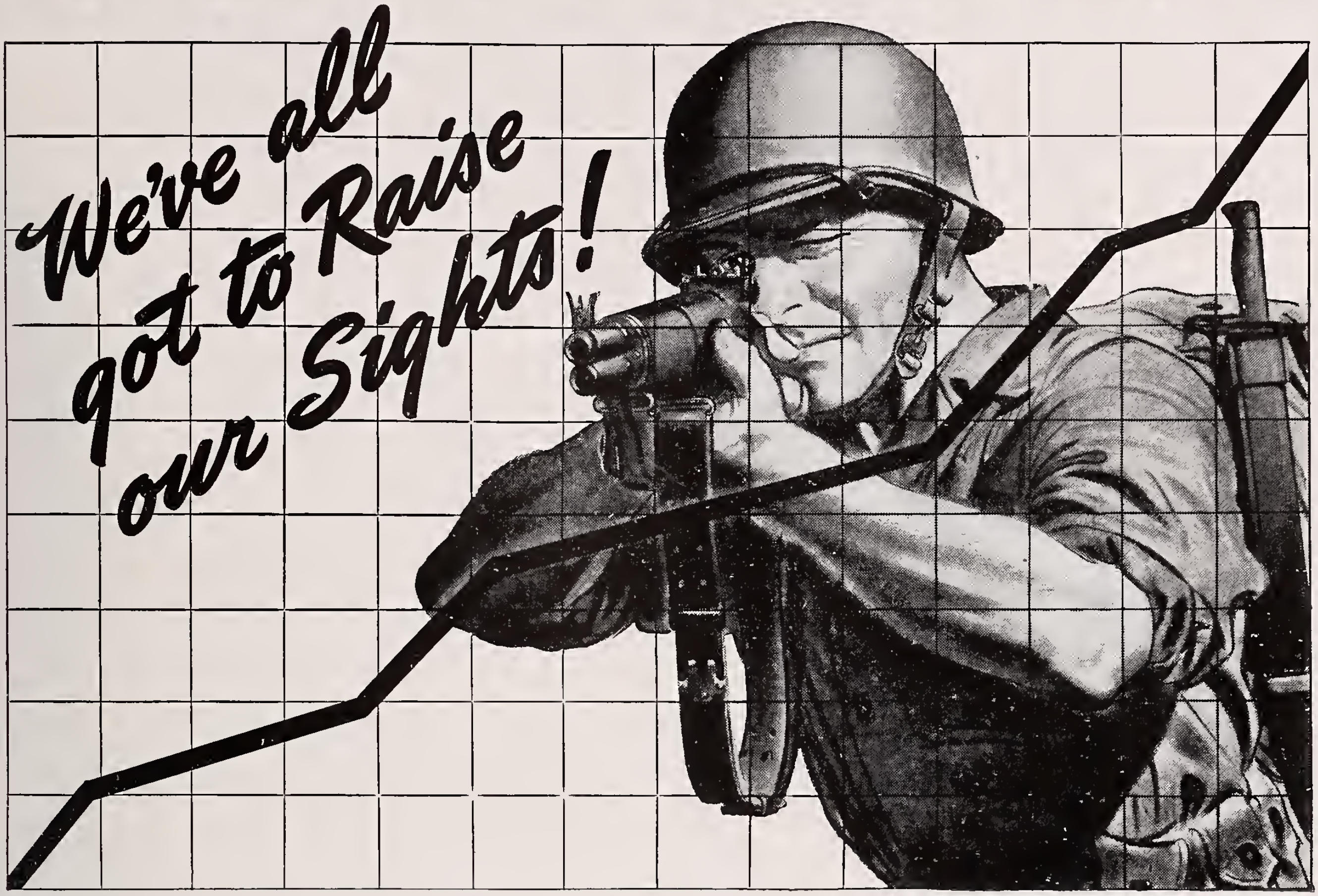
A meeting of District No. 3, I.A.T.S.E., was held at the Parker House, Boston, Mass., on Sunday, June 6, at which current problems, conservation and post-war prospects were discussed. The well attended gathering was addressed, among others, by P. A. McGuire, advertising manager of the International Projector Corp., and I. P.'s Harry Sherman. I.A.T.S.E. was represented by Louis Krouse, secretary-treasurer, and James J. Brennan, fourth vice-president.

NAVY ORDERS 5,000 PROJECTORS

The Navy has on order 5,000 projectors for use in its extensive training program, it is learned, which will be used in addition to the 2,000 projectors now in operation at naval shore bases and aboard ships.

Use of films for training by the Navy is extensive at this time, although before Pearl Harbor very little use was made of them. The Navy reports that at present "the catalogue of films—both motion picture and strip films—runs into thousands of titles and includes the productions of the Navy, the Army, the Coast Guard, industrial concerns, private motion picture companies and the governments of the United Nations."

TO HIT 'EM H-A-R-D-E-R



THE year 1943 promises to be the grimmest, hardest year this country has ever faced. Every effort, and every dollar of national income not absolutely needed for existence, should go into war work and War Bonds.

In the Pay Roll Savings Plan, America finds a potent weapon for the winning of the war—and one of the soundest guarantees of the preservation of the American way of life!

Today about 30,000,000 wage earners, in 175,000 plants, are buying War Bonds at the rate of nearly half a billion dollars a month. *Great as this sum is, it is not enough!* For the more dollars made available now, the fewer the lives laid down on the bloody roads to Berlin and Tokio!

You've undoubtedly got a Pay Roll Savings Plan in your own plant. But how long is it since you last checked up on its progress? *If it now shows only about 10% of the gross payroll going into War Bonds, it needs jacking up!*

This is a *continuing* effort—and it needs *continual* attention and *continual* stimulation to get fullest results.

You can well afford to give this matter your close personal attention! The actual case histories of thousands of plants prove that the successful working out of a Pay Roll Savings Plan gives labor and management a common interest that almost inevitably results in better mutual understanding and better labor relations.

Minor misunderstandings and wage disputes become fewer. Production usually increases, and company spirit soars. And it goes without saying that workers with substantial savings are usually far more satisfied and more dependable.

And one thing more, these War Bonds are not only going to help win the war, they are also going to do much to close the dangerous inflationary gap, and help prevent post-war depression. The time and effort *you* now put in in selling War Bonds and teaching your workers to save, rather than to spend, will be richly repaid many times over—now and when the war is won.

You've done your bit Now do your best!

This space is a contribution to victory today and sound business tomorrow by INTERNATIONAL PROJECTIONIST

INTERNATIONAL PROJECTIONIST

JULY 1943

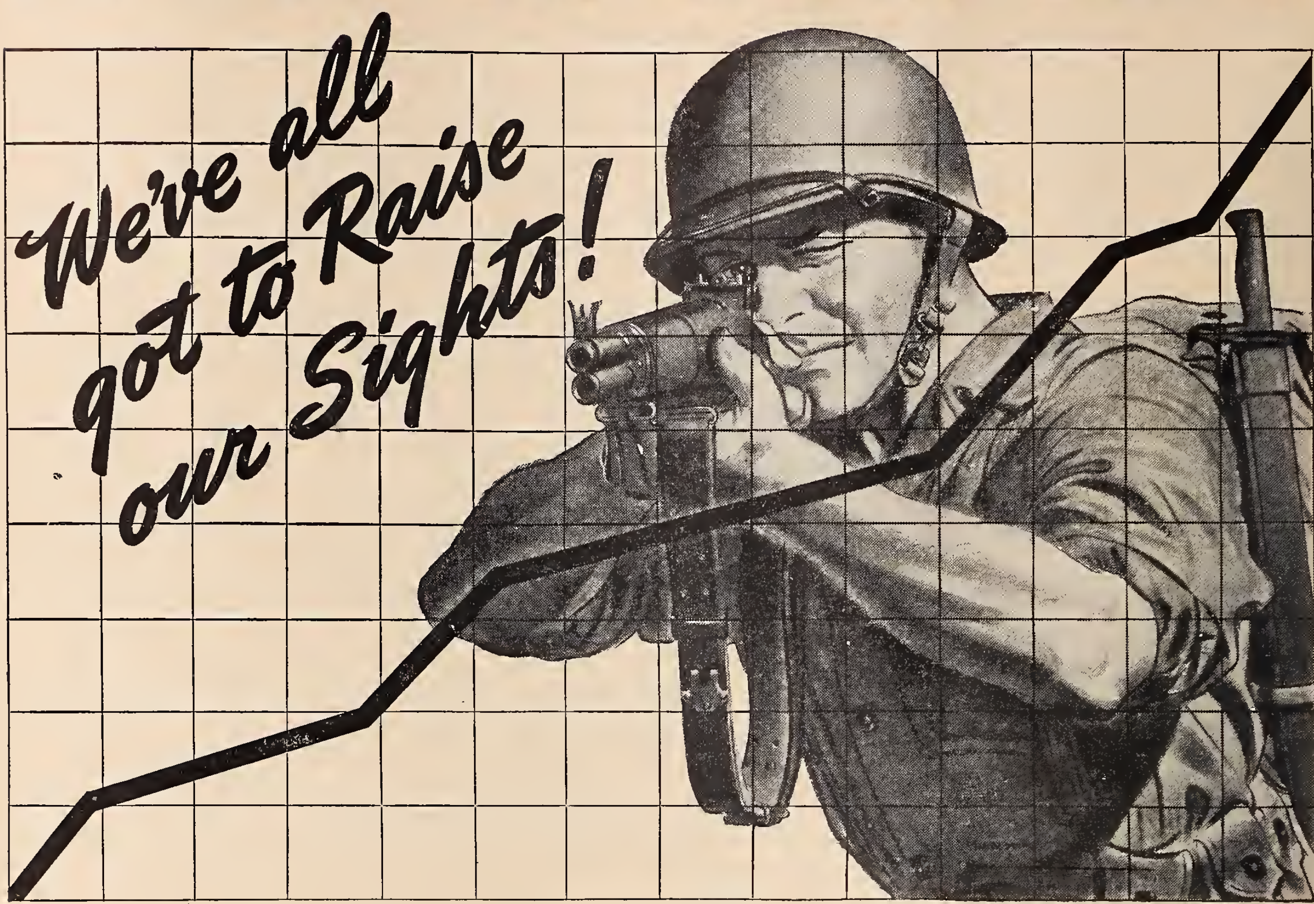
VOLUME 18 • NUMBER 7

25c A COPY • $2 A YEAR

TO PROJECTIONISTS!

Visitron cells are available for every type of sound projection equipment. Theatre supply dealers can advise the correct cell for your equipment. Buy from your supply dealer. If you wish to have your old cells tested without charge, write to G-M Laboratories, Inc., for instructions for shipping. Information furnished promptly.

TO HIT 'EM H-A-R-D-E-R



The year 1943 promises to be the grimmest, hardest year this country has ever faced. Every effort, and every dollar of national income not absolutely needed for existence, should go into war work and War Bonds.

In the Pay Roll Savings Plan, America finds a potent weapon for the winning of the war—and one of the soundest guarantees of the preservation of the American way of life!

Today about 30,000,000 wage earners, in 175,000 plants, are buying War Bonds at the rate of nearly half a billion dollars a month. *Great as this sum is, it is not enough!* For the more dollars made available now, the fewer the lives laid down on the bloody roads to Berlin and Tokio!

You've undoubtedly got a Pay Roll Savings Plan in your own plant. But how long is it since you last checked up on its progress? *If it now shows only about 10% of the gross payroll going into War Bonds, it needs jacking up!*

This is a *continuing* effort—and it needs *continual* attention and *continual* stimulation to get fullest results.

You can well afford to give this matter your close personal attention! The actual case histories of thousands of plants prove that the successful working out of a Pay Roll Savings Plan gives labor and management a common interest that almost inevitably results in better mutual understanding and better labor relations.

Minor misunderstandings and wage disputes become fewer. Production usually increases, and company spirit soars. And it goes without saying that workers with substantial savings are usually far more satisfied and more dependable.

And one thing more, these War Bonds are not only going to help win the war, they are also going to do much to close the dangerous inflationary gap, and help prevent post-war depression. The time and effort *you* now put in in selling War Bonds and teaching your workers to save, rather than to spend, will be richly repaid many times over—now and when the war is won.

You've done your bit Now do your best!

This space is a contribution to victory today and sound business tomorrow by INTERNATIONAL PROJECTIONIST

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

C. F. Alexander, *Technical Editor*
W. L. Lightfoot, *Associate Editor*

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Monthly Chat

DURING the post-war period we may look for many changes in equipment. New models will be introduced that will mark great forward strides in technical advancement in this industry just as will be the case in others. The era also will mean one of increased competition, for newcomers have entered the field as the old-line companies found it difficult to keep abreast of demands. As the newcomers gain experience they make their positions more secure for the peacetime period and many of them may be expected to survive. The result will be more producers supplying the trade, with consequently greater opportunities for refinements in sound and projection equipment. Current models undoubtedly will be standard for some time after victory, but keep eyes and ears alert for the many changes that are assured when complete post-war production programs become effective.

• • •

Rumors rumble regarding statements that the Controlled Materials Plan (CMP) is not eliminating industrial bottlenecks. This may be, as a supplementary plan is being mapped out, designed to get needed materials to the right spot in time. If rivets are unavailable to complete a ship, all the efforts in delivering the other units on time are lost. It's the old story "for the want of a nail" a kingdom was lost. The whole matter is one of coordinating sources of supply to necessary production. We all can help in the program, and plenty of conservation can be practiced in the projection room.

• • •

War work of all sorts taxes the milk of human kindness. Nerves get on edge, tempers break and our mental and physical selves weaken. Governmental agencies indulge in feuds, vocal mud is thrown and, generally, breakdowns result in the war effort. We must learn to relax in mind and body. A hobby is an ideal means to "get away" from the day-to-day grind. Recreation is another excellent manner to build morale. Both furnish an "out" from the war routine. You will benefit and the entire war effort will benefit. Uncle Sam knows this and is doing his part to maintain morale at the highest point possible. Which means that it's up to you to take a tip from those who know the essentiality of periodically divorcing one's self from one's principal activity.

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INTERNATIONAL PROJECTIONIST

VOLUME XVIII JULY 1943 NUMBER 7

Quality Essential in P. A. Systems

By *LEROY CHADBOURNE*

THERE is an increasing use of public address systems in theatres of all sizes for the reinforcement of speech. In the larger cities such systems are used by singers appearing with the numerous name bands. In the smaller cities and towns a p.a. system virtually is a necessity for stage announcements, in connection with local programs sponsored by the theatres and when Bingo or similar games are played. A properly functioning system aids in "putting the program across," whereas an unreliable system or one having poor quality makes the audience restless and detracts from an otherwise interesting program. Many systems in use have such poor quality as to be practically unintelligible, and it is surprising that the customers tolerate it.

A p.a. system is designed primarily for the reinforcement of the speaking or singing voice and so it is a common belief that the system need have good response only over the range of voice frequencies. It is true that good response over the speech frequency range will give intelligible quality, but there are harmonics above the basic frequencies that add the brilliance to the tone and thereby improve the speaking as well as the singing voice. Faithful reproduction, therefore, can be obtained only when the range of the system is such that these harmonics are faithfully reproduced.

A p.a. system consists essentially of a microphone to pick up the speech waves, a volume control to permit adjustment of the level of the speech input, an amplifier to raise the level of the speech adequately, and a speaker to convert the electric waves back into sound waves and project them into the audience area. This may be called the simple or basic system. When the microphone is located on the stage and it is desired to pick up from several different areas on the stage either simultaneously or periodically, additional microphones are positioned on the stage as required to obtain the desired results. In such cases a volume control is provided for each microphone and also an additional control, called the master, which is used to adjust the volume from all of the microphones. It follows then that the pickup level from each microphone can be adjusted independently, that one is superimposed upon the other and all mixed together at the master volume control. Hence the term "mixer" has been applied to the cabinet containing the individual and the master volume controls.

Many Types of Microphones

There are many types of microphones available under normal circumstances although just now the supply definitely is restricted. Each one has been designed for a specific purpose and will perform adequately when so used. There are two general classes, directional and non-directional. The second type is designed to pick up equally from all sides; that is, through a horizontal angle of 360°. The first type, as its name indicates, will pick up through an angle of 90° to 180°, depending upon the one selected. Under the two general classes we would find the crystal, ribbon, velocity, dynamic, condenser, and carbon types.

In selecting a microphone determine first whether it should be directional or non-directional. If pickup is desired from only one side, to exclude unwanted disturbances, such as audience noises, use the directional microphone. The various types of microphones vary considerably in price and this often has some bearing on the type finally selected. But the best microphone, consistent with the usage it will get, should be acquired. Low priced units serve a purpose, but cannot be expected to give the service that a higher priced unit will give. Some of these units are high impedance while others are low. If the run from the microphone to the amplifier is long, very careful shielding of the wiring is necessary when a high impedance microphone is used, or the use of coupling transformers at each end so that the line is actually low impedance. The output level of the various types varies, the high impedance types generally having a lower output level. This has a definite bearing on the amplifier gain required. In other words, obtain from the manufacturer the characteristics of the microphone in which you are interested, so that you may be cer-

tain it will work properly with the system you have planned.

Volume controls used with p.a. systems vary from a carbon potentiometer to a constant impedance variable pad. When only one microphone is used the volume control normally will be found in the p.a. amplifier if this is a separate unit from the sound system. Make sure that it is located conveniently so that adjustments can be made quickly. If the sound system amplifiers are used, then a separate volume control is employed. While it is admitted that an ordinary carbon potentiometer can be used, quality will suffer. A constant impedance control should be used and it should match the microphone and amplifier impedances. When more than one microphone is installed a "mixer" should be utilized.

There should be one volume control for each microphone and space provided for any possible additions. Furthermore, a master volume control should be included so that the combined output of all microphones can be regulated. This "mixer" panel or cabinet should be so located that the operator can see the stage action and hear the p.a. sound. He can then, and only then, adjust the controls so that the best effects will be obtained.

High and Low Level Mixing

There are two types of mixing, low level and high level. In low level mixing the output of the microphones is fed directly to the "mixer" and thence to the input of the amplifier. With this method any volume control noises and any pickup in the run from the microphone to the "mixer" are highly amplified. Due to the low level, the run must be very carefully shielded and this is further complicated if a high impedance microphone, without coupling transformers, is used. In high level mixing, the microphone output passes through a microphone amplifier and then through the "mixer". This microphone amplifier may be located close to the microphone so that the run to the mixer will be higher in level and thus less subject to pickup. The equipment cost with high level mixing is considerably higher, but it presents advantages over the low level mixing from a flexibility of equipment placement angle. There is a difference of opinion as to the merits of each type, however, among those who have developed p.a. systems.

The choice of an amplifier for a p.a. system should take into consideration the input impedance required for matching purposes, the gain required, frequency response and the output impedance to match the speakers. When high level mixing is employed, the gain of the microphone amplifier plus the gain of the power amplifier must be sufficient to give adequate volume. When low level mixing is used the amplifier is a combined voltage and power amplifier. Frequently, due to the high gain required, this amplifier consists of two separate units. The sound system power amplifier with suitable switching can be used for the power stage. In such cases an auxiliary or p.a. voltage amplifier is used only for the p.a. system. The power output should be capable of filling the audience area.

While the power required for p.a. purposes is not as great as for the sound system, additional power can be had for little extra cost and there is no necessity for skimping and running the danger of overloading. There is a tendency at present to run p.a. systems at high level so that some reserve power should be provided.

With regard to frequency response, while the extreme low end required in sound systems is not necessary in p.a. systems, it is suggested that an amplifier with good response be used on the high end; that is, comparable with that of a sound system amplifier. Here again this can be obtained at little extra cost and it is well worth it. In acquiring an amplifier be sure that it has the characteristics that will provide proper functioning with the other components of the system.

Good Speaker Is Essential

A p.a. system is no better than the speaker used with it. A speaker that is designed only for speech will not reproduce the overtones or harmonics of a speaking or singing voice, therefore the reproduction is flat and lacking in the brilliance that we are accustomed to in the reproduction of sound. There are speakers that have a good frequency response characteristic throughout the speech range and which also will reproduce the harmonics faithfully. They are naturally larger and more expensive than the ones commonly used with p.a. systems, especially the smaller systems.

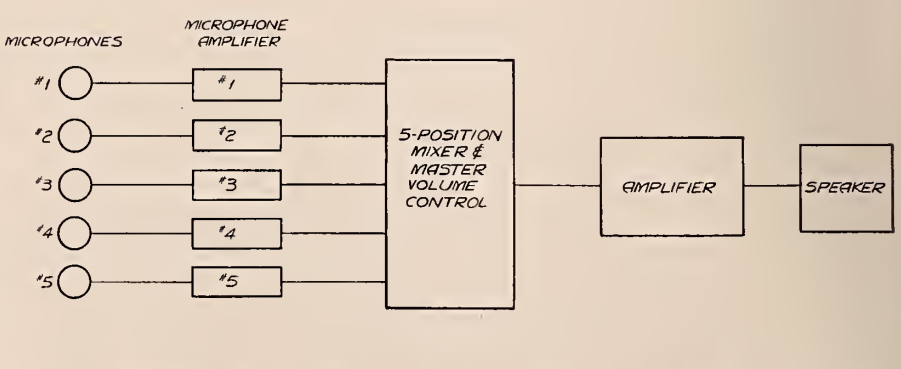
For the reproduction of speech a one-way speaker system should be adequate. It should not be necessary to go to a two-way system. Here again obtain the characteristics of the speaker you propose to use and be sure that it has been designed to give the service required. Whether it is of the permanent magnet or the electro-dynamic type is immaterial, for a good speaker of either type will perform equally well.

Location of Speakers

One more consideration is the enclosure in which the speaker is mounted. The size and configuration of this cabinet will determine the lower cut-off frequency. If the enclosure is too small or improperly designed, it is possible that the lower frequencies of the voice range will not be reproduced. We have all seen speakers in small cabinets and we have listened to thin, bodyless sounds emanating therefrom. This is evidence of the lack of the lower frequencies. Such speakers do not give quality reproduction. It is better to abide by the recommendations of a qualified manufacturer in regard to the type of speaker and enclosure required for the application.

The location of the speakers is important. There will be a minimum of two normally used in an installation. If the speakers are so located that the sound waves impinge on the microphone there probably will be feed-back or that well-known whistle that we have all heard in p.a. systems. If possible the microphone should be located behind a horizontal straight line connecting the speakers when they are located at the stage. If conditions are such that this cannot be done, obtain the horizontal coverage angle of the speakers from the manufacturer and plot on a scale plan of the auditorium, which also shows the location of the microphones. In this way alternate locations for the speakers may

(Continued on page 20)



Block diagram of p. a. system with five microphones and high level mixing.

Revised Projection Room Plans

A REPORT OF THE PROJECTION PRACTICE COMMITTEE OF THE S.M.P.E.†

This is the second and concluding instalment of this article, the first of which appeared in I. P. for May 1943. The projection room plans detailed herein constitute the third revision of the original plans published by the Committee in August 1932.

II.

Lighting

(7.1) *Projection Room Lighting.*—Approved indirect or semi-direct ceiling fixtures of the vaporproof type shall be used for general illumination, and should be arranged to be lighted from either the normal or emergency lighting circuit. A single reel-light of the vaporproof type with wire guard shall be centrally located on the projection room ceiling, and shall be equipped with sufficient approved cord to allow extension of this reel-light to all parts of the projection room proper.

Individual ceiling fixtures of the vaporproof type shall be installed at the operating side of each projector spotlight, stereopticon. or floodlight machine. All projection room lighting fixtures shall be equipped with keyless sockets and shall be controlled from wall switches. All lights in the projection room and associated rooms shall be properly shaded so as to prevent light from entering the auditorium through the porthole openings.

(7.2) *Rewind Room.*—An approved vaporproof ceiling fixture shall be installed for general illumination. A drop-light or wall-bracket fixture of an approved vaporproof type shall be provided over the rewind table. These lights shall be controlled from a wall switch independently of any lights in the projection room proper.

Ventilation

(8.1) *Projection Room.*—The projection room proper shall have the following ventilating facilities:

(*a*) Carbon arc exhaust
(*b*) Fresh air supply
(*c*) Projection room exhaust, including an emergency exhaust

The carbon arc exhaust system shall be a positive mechanical exhaust system independent of all other ventilating systems of the theatre. Each projector, spotlamp, stereopticon, or floodlight machine, if of the carbon arc type, shall be connected by a flue to a common duct, which duct shall lead directly out of doors. Reduction of the ventilation to each projector as required shall be accomplished by means of a local damper between the projector lamp-house and the projection room ceiling, and in addition, by means of the damper on the lamp-house proper if provided.

This exhaust system shall be operated by an exhaust fan or blower having a capacity of not less than 50 cubic-feet of air per minute for each arc lamp connected thereto. The exhaust fan or blower shall be electrically connected to the projection room wiring system and shall be controlled by a separate switch, with pilot lamp, within the projection room proper.

There shall be at no time less than 15 cubic-feet of air per minute through each lamp-house into this exhaust system. Figure 4 shows the general arrangement. The ducts shall be of non-combustible material, and shall be kept at least 2 inches from combustible material or separated therefrom by approved non-combustible material, not less than 1 inch thick.

The fresh-air supply to the projection room shall consist of not less than two intake ducts located at or near the floor and at opposite ends of the room, and shall be connected into the main air-supply ducts of the building. There shall be no connection between this air-supply system and any of the exhaust systems of the projection room.

It is recommended that gravity-operated dampers connected to the emergency port-hole release system be installed in the fresh-air intake registers to prevent smoke from entering the main theatre fresh-air duct system, in case of a fire in the projection room area.

The projection room exhaust system shall be a positive mechanical exhaust system having a normal capacity of not less than 200 cubic-feet per minute and having an auxiliary emergency capacity of not less than 1000 cubic-feet per minute for operation in emergency, *i.e.*, fire.

The ventilation system shall terminate in ceiling grilles in the projection room, which shall not be less than two in number. In no case shall this room exhaust system be connected into any of the ventilating systems of the theatre proper. The emergency position of this fan shall be controlled by a switch (Figure 5) operated automatically by the shutter control system, when the latter is actuated either manually or by melting of the fusible links. This exhaust fan shall be electrically connected to the emergency lighting system of the building. Control shall be provided for manual operation of this fan from a point immediately outside the projection room proper, in addition to the emergency control in the shutter system.

(8.2) *Rewind Room.*—The general ventilation of the rewind room, *i. e.*, fresh-air supply and room exhaust, shall be a part of the projection room fresh-air supply system and the projection room exhaust system. There shall be no connection between the projection arc ex-

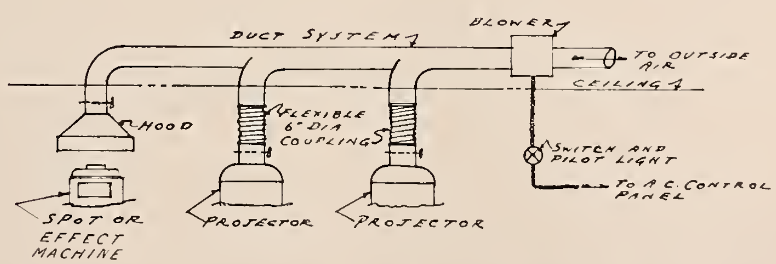


FIGURE 4. *Equipment ventilation system: blower capacity 400 cu-ft. per min.; minimum air movement through lamp houses with blower idle, 15 cu-ft. per min.*

† *J. Soc. Mot. Pic. Eng., Sept.* 1942.

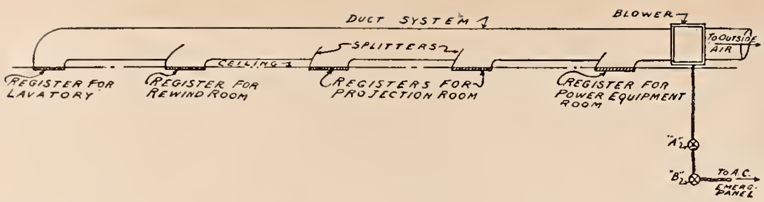


FIGURE 5. ***General and emergency ventilation system: normal blower capacity 200 cu-ft. per min.; emergency capacity 2000 cu-ft. per min. (A) Switch and pilot lamp for normal operation, inside projection room; (B) switch and pilot lamp for emergency operation, outside door of projection room; also connected to port fire-shutter control mechanism. (Two or more fresh-air intakes required at or near the floor at opposite ends of the room.)***

haust system and any part of the rewind room ventilating system.

Film cabinets, if of the single-compartment type, shall be vented to the outside air by means of a gravity vent (*see Sec. 12.2*).

(9.1) *Port-Hole Shutters.*—Each port opening shall be provided with a gravity shutter of approved construction. The shutter and its guides shall be constructed of not less than No. 10 gauge iron and the shutter shall be set into the guides not less than 1 inch at the sides and bottom, and shall overlap the top of the port opening not less than one inch, when the shutter is in a closed position. Shutter guides shall be of welded construction, and should be built into the masonry of the projection room walls (Figure 6).

Shutters shall be suspended, arranged, and so interconnected that they will all close upon the operation of some mechanical releasing device or the operation of some fusible link, so designed to operate automatically in case of fire or other emergency requiring immediate and complete isolation of the projection room from the other portions of the building.

Each shutter shall have its individual fusible link above it. A fusible link shall be located also above each upper projector magazine which upon operation shall close all the port shutters. There shall be provided also a suitable means for the manual release of the shutter system from any projector head and from a point near each door within the projection room. Shutters shall be free-acting. Shutters on openings not in use shall be kept closed always.

It is recommended that shutters be closed each night at the close of the show as a daily check on their operation. Figure 7 shows a recommended method for arranging the port shutter system. All large shutters such as for spotlamps, stereopticons, and floodlight machines (when used) shall be hung in counterweighted systems to facilitate manual operation. All such large shutters, however, shall be so arranged that the release of the regular shutter system will close the large ports also.

(9.2) *Noise Transmission.*—The Committee recommends the use of means other than glass in projection ports to prevent transmission of noise from the projector room to the auditorium, such as by reducing the free aperture of the port to the minimum size necessary to pass the projection beam, or by the use of fireproof sound-baffles. Observation ports shall be fitted with a good grade of plate glass set in metal frames at an angle to the vertical to avoid direct reflection, and such glass shall be easily removable from the projection room side for cleaning. The purpose of this glass is to reduce noise transmission into the auditorium.

Heating

(10.1) *General.* — Proper provision shall be made for heating the projection room. The same facilities used for heating the theatre shall be extended to the projection room.

Painting and Floor Covering

(11.1) *Painting.*—The color of the walls shall be olive-green to the height of the acoustical plaster. The latter shall be painted in accordance with the instructions of the manufacturer of the material, and preferably a dull buff color. The ceiling shall likewise be painted in accordance with these instructions but in a white color. All ironwork of the projection ports shall be covered with at least two coats of flat black paint.

(11.2) *Floor Covering.*—Where local regulations permit, the floors of the projection room and rewind room shall be covered with a good grade of battleship linoleum cemented to the floor. The floor covering shall be laid before the equipment is installed.

Equipment

(12.1) *Projection Room.*—All equipment to be used in the projection room, including the projectors, arc lamps, sound equipment, *etc.*, shall be of approved type.

All shelves, furniture, and fixtures within the projection room suite shall be constructed of metal or other noncombustible and approved material. An approved metal container shall be provided for hot carbon stubs. Adequate locker space for projectionists' clothing shall be provided.

(12.2) *Rewind Room.*—In the rewind room shall be provided an approved fireproof film-cabinet or safe, a rewind table, approved rewind equipment, a mechanical film-splicer, an approved film-scrap can, and an approved storage cabinet for film-leaders, snipes, *etc.*, used only at various intervals.

The film-cabinet, or safe, shall be capable of holding 25,000 feet of 35-mm film on standard reels. Doors on film-cabinets or safes shall be of the automatic tight-closing type, and either of the single-reel compartment or single-compartment type.

Film-cabinets of the single-compartment type holding in excess of 50 pounds of film (10,000 feet) should be vented to the outside air by means of a gravity vent. The vent should not be less than 36 square-inches in area for each 50 pounds of film stored. This vent shall be constructed of non-combustible material and shall be kept at least 2 inches from any combustible material, or shall be separated therefrom by approved non-combustible material not less than one inch thick.

Film-cabinets of the single-compartment type having a capacity of more than 50 pounds of film (10,000 feet) also should be equipped with an automatic sprinkler-head, of the ¾-inch size, connected to the theatre water-supply. It is recommended that pressure at such sprinkler head be not less than 15 pounds.

All tables, racks, and all furniture shall be of metal or other approved noncombustible material, and shall be kept at least four inches away from any radiator or heating apparatus. Tables shall not be provided with racks or shelves beneath them whereon may be kept film or other materials.

The film-scrap can shall have an automatic, self-closing lid, and shall be of approved type. It is recommended that a type designed to keep scrap-film immersed in water at all times be used.

Quantities of collodion, amyl acetate, or other inflammable cements or liquids kept in the rewind room for any purpose shall not exceed one pint. No stock of inflammable materials of any sort what-

ever shall be permitted within the rewind room except as mentioned above.

Film shall be kept in the film-cabinet at all times except when it is being projected, rewound, or inspected. Any films in addition to those used for the current showing or in excess of that permitted by local authorities shall be kept in their original shipping containers. Film-leaders used occasionally may be kept in an approved cabinet designed for that purpose.

All film splices shall be made with approved mechanical cutting and splicing machine. No hand cutting or splicing shall be permitted.

(12.3) *Fire - Extinguishing Equipment.*—Local authorities having jurisdiction with regard to fire-extinguishing equipment should be consulted regarding the proper types, numbers, and locations of such equipment.

It is the recommendation of this Committee that fire-extinguishers of the carbon tetrachloride or carbon dioxide types be considered for use in projection rooms, as they have proved to give the most effective protection for the specialized equipment within the projection room. In addition to their being the most effective fire extinguishers, they do not cause the ruin of the precision equipment installed within the projection room proper, if it is necessary that they be used for any emergency.

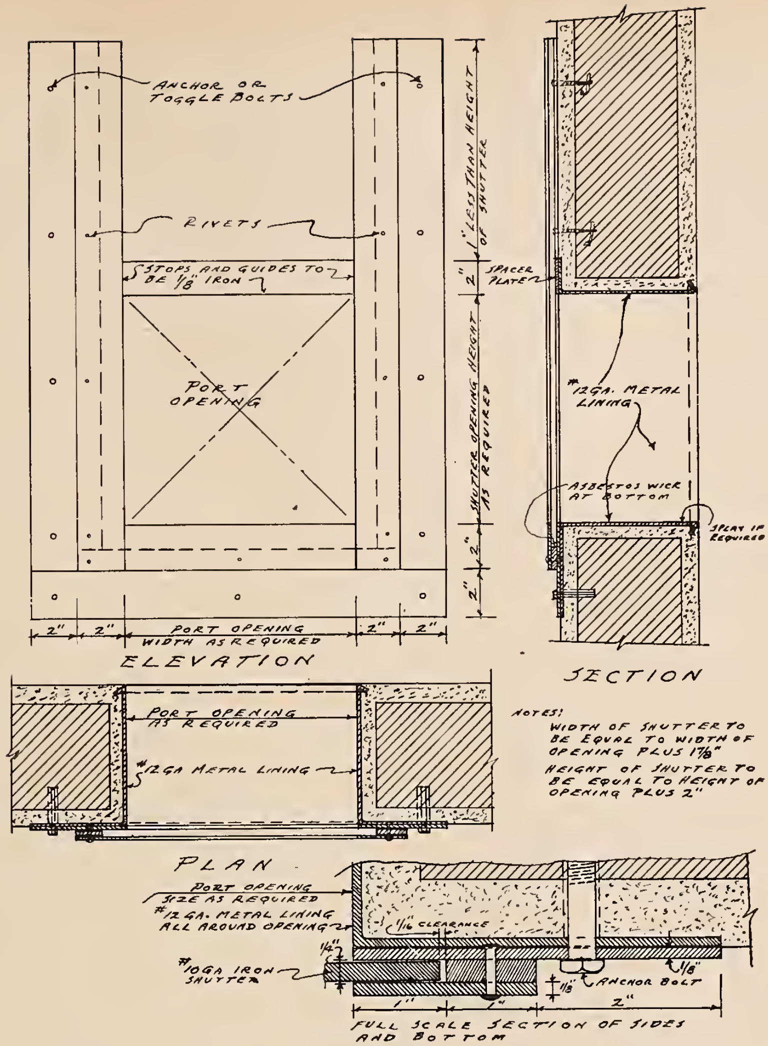


FIGURE 6.

Example of port shutter construction. Although this construction shows rivets, spot welding is preferable.

Miscellaneous

(13.1) "No Smoking" signs shall be posted in prominent places and matches should not be carried by any employee having access to the projection room.

(13.2) *Operation.* — Motion picture projectors shall be operated by and shall be in charge of qualified projectionists who shall not be minors. A projectionist should be stationed constantly at the operating side of a projector while it is in operation. A proper factor of safety in operation, as well as avoidance of imperfect operation of projection equipment or unjustified interruptions of service can be attained only by having an adequate personnel in the projection room.

(13.3) *Action in Case of Fire.*—In the event of film fire in the projector or elsewhere in the projection or rewind room, the projectionist shall immediately shut down the projector and all arc lamps, operate the port shutter release at the point nearest him, turn on the auditorium lights, leave the projection room immediately, and notify the manager of the theatre or building.

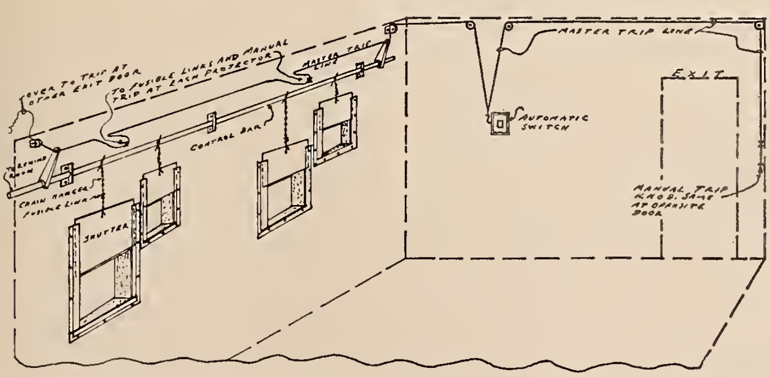


FIGURE 7. ***One of many possible arrangements of the port fire-shutter control. The automatic switch operates the exhaust fan and emergency lights.***

NEW RADIANT PROJECTION UNIT AIDS VISUAL TRAINING

Designed primarily for our armed forces, but now available for educational and other visual training use, a new projection screen unit is announced by the Radiant Manufacturing Corporation, Chicago. It is called the Radiant Day-Time Projection Box, and permits the showing of pictures in broad day light by means of a shadow box construction. The unit has large audience capacity and gives far greater light intensity due to a glass beaded, brilliant "Hy-Flect" screen surface.

Construction of the unit permits visual training directors, instructors and educators to set it up quickly and easily and to adjust the height to four different positions. It folds compactly and all parts are easily fitted into a storage case. Films or slides can be projected clearly to audiences up to 150 persons.

Unusual Effects Produced With Discarded Equipment

By *FRED BENDELL*

MEMBER, L. U. 634, SUDBURY, ONT., CANADA

That necessity is the mother of invention is an axiom old and true. In these days of conservations of materials, the resourcefulness of man is amazing. The accompanying article. submitted by one of our Canadian readers, describes in detail how he and a fellow worker enhanced the showing of pictures at the theatre where they are both employed by producing unusual and timely effects with the aid of old and discarded equipment.

AFTER a bit of experimenting with the able assistance of H. J. Plexman, a fellow worker at the Regent Theatre, Sudbury, Ont., Canada, where we are both employed as motion picture projectionists, we hit upon several ideas for unusual effects. It was our desire to brighten up the presentation of pictures at our theatre, but since the theatre budget would not permit costly expenditure for equipment that was not considered essential to the showing of pictures, we found ourselves confronted with the alternative of either forgetting about the matter or falling back on whatever ingenuity we possessed.

We examined all the old and discarded equipment lying around the theatre and found an old copper toilet float to which was attached a rod about 8 inches long. We painted this copper float black and covered the whole curved surface with pieces of broken mirror we picked up from the junk pile. (Testors cement was used for pasting these broken bits of mirror on the float.) We then discovered an old valve opener and changed the connection so that it would run in one continuous direction. The mirrored ball (copper toilet float) was attached to the shaft of the valve opener by a sleeve. Oh, yes, it ran on 16 volts a.c. and Plexman rewound a transformer for use with the valve opener.

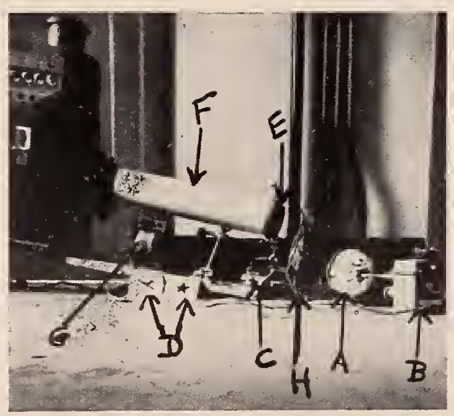
We then took an old Powers lamphouse found lying around the attic and adapted it for use with a 1,000 watt projection bulb. In the slide carrier we placed a piece of tin with a star-shaped cutout. The beam from the lamphouse was directed on the slowly rotating ball, which was placed about one-half inch from the floor on the front of the stage. The ball rotated very slowly, making one complete revolution in 12 minutes, thus giving the effect of stars slowly moving across the ceiling and walls of the theatre.

An ordinary mirror was placed under the mirrored ball and the illusion of stars moving in opposite directions was most effective. This effect was further heightened by the use of a color wheel which was driven by a phonograph motor. The stars changed colors, and the audience reaction was most gratifying.

With the showing of the picture "Eagle Squadron" at our theatre, we used a different effect. A piece of tin, with the outline of an airplane cut out in the center, was inserted in the slide carrier. When the title of the picture was flashed on the screen the effect of airplanes moving across the ceiling was produced. Of course, the mirror underneath the ball was removed, otherwise we would have had planes moving backwards and forwards, and in all directions.

With the ball close to the lamphouse condenser, all we needed were the condenser lenses. Although a sharper focus may be obtained by the use of a stereopticon lens, this is not absolutely necessary. (I might mention here that for this effect the ball was set up beneath the stage and the lamphouse was camouflaged from the audience side.)

Another effect was produced during the Christmas holidays by painting holly leaves on a glass slide taken from the permanent stereopticon machine in the projection room, and this pattern was projected around the opening of the proscenium.



Discarded equipment used for effects: A, mirrored ball; B, valve opener; C, phonograph motor driving color wheel; D, airplane and star cutouts; E, lens; F, cardboard tube to prevent loss of light; G, transformer; and H, color wheel.

The possibilities of creating unusual effects without the aid of costly equipment are many; all that is needed is a bit of planning plus a dash of ingenuity. The results will compensate for the work and trouble involved. No doubt there are many O.I.P. readers who have similar gadgets on tap. and I believe that an exchange of ideas along these lines would find a most appreciative audience.

POST-WAR DELIVERY PLAN ANNOUNCED BY NATIONAL

The "Magic Bridge" plan just announced by the National Theatre Supply, division of National-Simplex-Bludworth, Inc., embodies a program to insure accelerated delivery of all post-war theatre equipment without advance options or down payments. It provides a medium with which exhibitiors can span the gap between post-war needs and their quick realization.

According to National officials the "Magic Bridge" plan is a special equipment survey covering a theatre's future requirements of projection and sound, generators and rectifiers, chairs, carpets, screens, lenses, marquees, ventilating and all other new equipment that may be needed for replacement, modernization or complete new installations once the war has been won.

FATE OF OWI PICTURE BUREAU IN DOUBT

Lowell Mellett, bureau chief, said early in July that practically everyone in the Office of War Information motion picture bureau received notification of dismissal as of July 15. A few are being retained, but production and 16 mm. distribution definitely have been discontinued.

Some hope is held that at least some of those whose services have been terminated will be recalled when Elmer Davis, OWI director, eventually decides how to distribute available funds. Mr. Davis recently emphasized that he is concerned principally with the fate of the motion picture bureau.

BOOTH NAMED VICE PRESIDENT OF BELL & HOWELL CO.

J. Harold Booth has been appointed vice president in charge of war negotiations, war expediting, subcontracting, employee training, personnel and public relations, sales, service, and advertising for the Bell & Howell Company, manufacturers of motion picture equipment and optical devices.

Mr. Booth joined the New York City office of the company at the age of 20, advancing consistently when in 1938 he was named general sales manager in charge of service and advertising. His latest appointment as vice-president is but a natural outgrowth of his understanding of and control over the organization's affairs.

IP AT YOUR SERVICE

This department is a collection of random thoughts and some not so random; fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Reducing "Wows" on W. E. 209 and 211 Reproducer Soundheads

On W. E. 209 and 211 reproducer soundheads, I have found the following method to be very effective in the correction of "wows" caused by the kinetic scanner: Drawing ASXX-5459, Issue 1, shows the lens and film guide roller holder assembly and special notation is made in reference to "this screw and nut are to be removed." After encountering much difficulty with this type head in correcting "wows," I found that by replacing the screw and nut in question and adjusting the guide roller so that there would be a clearance of two thicknesses of film between the scanner drum and the guide roller, there would be allowed some slippage between the two, thus correcting the uneven speed of the scanner. This cuts down on the acceleration time on starting, but when the projectionist threads up on the 9-foot mark it will not cause any trouble. The foregoing has been in practice now for four months, with operation of soundheads being most satisfactory and no further trouble reported. — G. E. Geiger, *RCA*.

Improving Operation of PS-21 and PS-22 Type Soundheads

In some PS-21 and PS-22 type soundheads, because of wear and warpage of the sound gate mechanism, it has been impossible to align the film travel (with test film) without the outside lateral guide roller rubbing against the film shoe. This often stops the flange from rotating and causes needless wear. By installing four thin shim washers under the optical system, the beam was so aligned that there was plenty of clearance between the shoe and the flange. In fact, both flanges rotate more freely after adjustments are properly made.—L. W. Leidy, *RCA*.

Repairing Old-Style Exciter Lamp Holders

I have found that when the old-style exciter lamp holders in PS-21 and similar soundheads are shorted, it is due to the very small bakelite sleeve which covers the screws holding the spring center contact. This sleeve deteriorates from heat and allows the spring contact to short on the screw. Repairs can easily be made in the field by dismantling an old radio jack and removing the sleeves therefrom, which can then be adjusted to the proper length. It will also be found that the jack 2-hole insulating strips can be used to replace worn ones of like shape on the exciter lamp holder. —C. R. Shepard, *RCA*.

Repairing Aluminum Reels

A number of aluminum reels that were broken only on one side were salvaged from the junk pile by removing the undamaged sides and discarding only the parts that were broken. Holes for bolts were then drilled in the undamaged sides and by putting two parts together a satisfactory reel was the result. These reels were trued by putting them on the rewind and rotating slowly and checking by marker on bench. Smaller breaks were successfully repaired with liquid solder. —H. W. Hepler, *RCA*.

Emergency Operation With Faulty Toggle-Type Fader Switch

With reference to toggle-type fader switches, examination will reveal that jumpers are so placed between terminals that one is connected as a three-way switch and the other as a four-way switch. This makes possible several means of emergency operation, depending on which switch fails and the nature of the failure. Of course, it should first be determined whether or not all changeovers may be made from one switch. If this is possible, it probably would be wise to finish the show in this manner.

When circumstances permit working on the equipment without danger of sound interruption, it should at once be determined whether the three-way or four-way switch has failed. The three-way switch is the one with only one jumper, from top to bottom terminal on one end. Only one-half of this switch is normally used and it may be possible that the other half is in good condition. If not, replace this switch with a standard three-way switch.

If the four-way switch has failed, replace it with the one used as a three-way, taking care to rewire it in exactly the same manner as the one removed, and make sure that all wires are replaced in their exact positions. It would be well to tag the wires as they are removed.

The one used as a three-way switch may now be replaced by a standard three-way switch. If either switch has failed in such a manner that changeover cannot be made from the other, service may be restored temporarily by the following procedure:

If the three-way switch (3 wires attached) has failed, remove the wire from the terminal at one end and place it under a terminal with one of the wires at the other end. Changeovers may then be made with the other switch.

If the four-way switch (6 wires attached) has failed, remove the two wires from the terminals at the end which has only two wires attached and place them, one under each terminal, at the opposite end of the switch.

A word of caution is necessary concerning the use of jumpers to cut out either switch. This should not be done, because under certain conditions a short circuit will result if the open switch points should make contact while the jumper is in place. — Clifford D. Welch, *RCA*.

Correction of Hum and Oscillation

Capacitor C-23 used in MI-4229-4236-9325 and 9327 amplifiers often causes noisy reproduction, hum and oscillation. Hum and noisy reproduction is found to be due to leakage and falling off in capacity. Open circuiting of this capacitor causes oscillation at settings of 6 to 10 on the volume control.—J. H. McGinley, *RCA*.

Emergency Exciter Lamp Operation

In case of failure of exciter lamp power unit, an ordinary 500-watt electric heater element can be used in series with the exciter lamp and operate direct from the 110-volt line.—Iver Grann, *RCA*.

Grease for ERPI-709-712 Drives

On the ERPI-709 and 712 drives, many projectionists have been using Chassis "S" Grease, which is of a butter-like substance. As soon as the drive

(*Continued on page* 22)

IN THE SPOTLIGHT

By

HARRY SHERMAN

PRESIDENT ROOSEVELT suffered his first defeat on a serious labor issue with the passing by Congress of the Smith-Connally anti-strike bill. What will be the effect of this new bill on labor? is the question heard on all sides. Time alone will give us the answer, but it is our opinion that it will only serve to stimulate labor unrest and may even bring on a new series of strikes. With very few exceptions, labor has stuck to its no-strike pledge. This new bill, however, establishes a new procedure whereby strikes may now be legally called, for it definitely states that *30 days after labor serves notice of its claims, its members shall determine, by a secret ballot, whether or not to call a strike.* In other words, by following the foregoing procedure, strikes during wartime are legally sanctioned!

The rank and file of organized labor have been seething with unrest—adherence to the little steel formula has made it difficult for them to meet the rising costs of living. They have been kept in line largely through the efforts of the labor leaders, but with the passage of this new anti-strike bill the unions are now in a position to demand a strike vote, and it will be a particularly arduous task for the labor leaders to stick to their no-strike pledge. Professional agitators and just plain trouble makers will have a field day among the disgruntled workers, and the tension in the labor field during the coming months will be increased manyfold.

Many people believe that Congress passed this bill in the heat of resentment against the stand taken by John L. Lewis in the coal strike, but whatever the reason or reasons may be, we have grave doubts as to the wisdom shown by our legislators. Professional politicians view the passage of this bill as a political victory over our president—their anti-Roosevelt, anti-administration tirades override all other considerations. Their motto seems to be: Roosevelt is for Labor, therefore we are "agin" it, etc. We believe that the president's veto of this vicious labor-baiting bill has earned him the support of organized labor throughout the country, and this support will have a telling effect in the coming 1944 elections.

With all due respect to the late Samuel Gompers who strongly disapproved of labor taking any part in politics, it is becoming increasingly evident that labor will have to forget the Gompers tradition and take a more active role in the lawmaking policies of this country.

● A gold life membership card in Local 23, Providence, R. I., was recently awarded to Alex Dekker, former president of the local. Fred Newcomb, secretary of the Third District and a lifelong friend of Dekker, made the presentation speech.

● Harry Rubin, Director of Sound and Visual Projection for Paramount Theatres, was recently tendered a surprise birthday party by his projection staff. Jesse Hopkins, who has been associated with Harry for more than 20 years, acted as toastmaster on the occasion.

● The merger between I. A. International Photographers Local No. 659, Hollywood, Calif., and the American Society of Cinematographers, has finally been consummated. The A. S. C. will hereafter function only as a social organization, with its members now having full membership rights in Local 659.

● Motion picture projectionists and sound repair men have been exempted from active war duty by the Canadian government. This bears out a prediction we made at the Third District meeting held in Boston last month. Although many of our government agencies are determined to keep up the "home front morale," no definite steps have as yet been taken to classify the projectionist as essential to the war effort and keep him working in the theatre. Faced with the alternative of either exempting two motion picture projectionists who were called before them for final classification, or closing the theatres where they were employed, the draft board officials in Portland, Maine, permitted these men to return to their jobs. These officials did more than merely give lip service to the importance of the motion picture theatre in keeping up the home front morale, they gave action. We wonder how many more draft boards throughout the country will take the initiative shown by the draft officials in Portland, Maine.

● This item is for the particular attention of those well meaning "friends" of ours who took us to task for referring in these columns to Harry Brandt as a labor baiter.

The American Society of Composers, Authors, and Publishers, more commonly known as ASCAP, has publicly accused Harry Brandt, as head of the Brandt Circuit and of the Independent Theatre Owners Association, as being a party to coercion and monopoly in the New York area. ASCAP alleges that Brandt, acting for his circuit and for the members of ITOA, coerced New York independent theatre owners into appointing him booking agent for their theatres. They further charge that theatres not in agreement with Brandt's demands were threatened with the opening of rival theatres in close proximity to them which would drive them out of business. In the charges filed by ASCAP are listed theatres acquired by Brandt under these circumstances at prices "*far below their actual value.*"

These are pretty harsh words, and we don't think the ASCAP gentlemen would make such an accusation without good and sufficient cause.

● The Local 306-Empire State-Century Circuit injunction case is still in the courts, with the unions getting the old run-around. It seems rather strange to us that the Century Circuit, with offices in New York County, should apply for an injunction in Kings County. Both Local 306 and the Empire Union were unsuccessful in their attempts to have the case transferred to New York County. Also, an application for a stay in the

proceedings was denied the two unions.

One of the judges handling the case is a former attorney for Local 306. In our opinion, he should not have this case tried before him but should disqualify himself immediately. Whatever the outcome, we can look for a knock-'em-down-drag-'em-out fight between Century Circuit and the two unions.

● Motion pictures today play a very important part in the training of our armed forces. Naval shore stations have in operation about 2,000 projectors that are used not only for recreational purposes, but are an integral part of naval training. An order for an additional 5,000 projectors for bases throughout the world is in the offing.

These machines all have to be operated by trained men, who, as we so often have pointed out, undoubtedly will seek employment when the war ends in the professional projection field. What will happen to this industry when it is overrun with these newcomers? One guess is as good as another—it is our guess that unless plans are made NOW for a working agreement between all I. A. local unions for the protection of their memberships, we will find ourselves in pretty much of a pickle when these soldier-projectionists return to civilian life.

● We understand that trained projectionists are being offered a yearly salary of $3800, plus an extra $2000 for living expenses, to operate projection machines on the African front.

● We regret to report the loss of another personal friend in the death of Hal Johnstone, for many years secretary of Local No. 110, Chicago, Ill. Hal and the writer pioneered for the projectionists at many caucuses held at I. A. conventions. He was a rather quiet chap and was highly regarded by all who knew him.

● It seems that the film exchange unions in Mexico are getting wise to a thing or two. The Hollywood producing companies, with offices in Mexico, have been asked by the film exchange workers for an increase of 22%, which, even if granted, would still be peanuts. Do we see the fine hand of Manual Ayala in these negotiations?

● If there had been TWO EXPERIENCED projectionists on duty at the Melba Theatre in Goldwaithe, Texas, when a fire broke out in the projection room, it most likely would have been prevented. According to an official statement, the fire was caused by the "breaking of film which wound around the intermittent sprocket." No doubt the projectionist on duty at that time was so busy attending to his other projection room chores, such as the rewinding of film, etc., and could not get to the side of the projection machine in time to prevent the fire from spreading. But with two men in a projection room, with one constantly at the side of the projector in operation while the second man attends to the other projection room duties, such mishaps are not likely to occur.

Oh, yes, the theatre was covered with insurance and the owners are now looking for some "emergency" equipment so that they may continue to operate the theatre. No mention was made, however, of insurance for the lone projectionist on duty.

We read of fires in other theatres throughout the country and of the expectancy of rebuilding them—"if the government permits," of course. That is all very fine, but what is being done to protect the man in the projection room against the ever-present fire-hazard? Nothing—and exactly nothing will be done until we have a duplication in one of our motion picture theatres of the recent Cocoanut Grove disaster. And when that happens, watch for the buck-passing by our worthy legislators!

● A memorial plaque honoring those members who served in World War 1 and those who are now in the armed forces of our country was dedicated in the lobby of a local theatre in Syracuse, N. Y., by the stay-at-home members of Local No. 376. Hereafter the plaque, which bears the names of the members who served in the first World War and those serving in the present war, will hang in the labor temple. Local 376 members who are veterans of World War I are John R. Bartle, Melvin A. Denny, Harry J. Gurnes, John P. Kerley, Wm. H. Maxon, Henry McConnell, Robt. H. Poulsen and Andrew J. Seeley. The men on active duty in the present war are Harry C. Burley, Elmo H. Carpenter, Earl F. Cecile, Robt. F. Dumas, Chas. R. Nelson, Philip T. Rossomondo, Martin Wazlahowsky and Warren E. Williams. The plaque was unveiled by Rossomondo, an engineer's mate stationed at the Sampson, N. Y., naval base. Speakers at the dedication were Mayor Thos. E. Kennedy, Wm. Goff, of the AFL, and Fire Chief Chas. F. Wilkes. George Raaflaub and William Maxon, of 376, were in charge of arrangements. The entire membership of the local, in addition to city officials and theatre employees, attended the ceremonies.

● *Case history for Local No. 253, Rochester, N. Y.* Several years ago representatives of the Schine Circuit in Rochester appealed to Local 253 officials for a wage cut—bad business, operating at a loss, etc., being among the excuses offered. Like many other I. A. locals throughout the country, Local 253 members took a cut in salary with the expectation of having the cuts restored to

(*Continued on page* 19)

E. P. Curtis, Former Eastman Kodak Executive, Now Brigadier General

AS A result of distinguished leadership in the Tunisian campaign, Col. Edward P. Curtis received President Roosevelt's nomination and Senate approval for promotion to Brigadier General. General Curtis, World War I ace, is widely known as Eastman Kodak Company's motion picture film sales manager, and is a familiar figure on the West Coast, particularly in Hollywood, where in civilian life he spends a large part of each year.

During the last war he destroyed six German planes over France and was awarded the Distinguished Service Cross and the Croix de Guerre, and was acclaimed the youngest officer of his rank in the Air Service. In November 1940 he obtained leave of absence from the Eastman Kodak Company for military service and was commissioned a Major in the Army Air Corps. Promotion to the rank of Lieutenant Colonel followed in January 1942.

General Curtis landed in Africa with the first American invasion in this global war and was assigned shortly thereafter as chief of staff for Lt. Gen. Carl Spaatz, commander of the Allied Air Forces. He attended the Casablanca Conference of President Roosevelt and Prime Minister Churchill in that capacity.

A Complete Study on the Prevention of Film Damage

By HENRY B. SELLWOOD

"Film damage" is by no means a new phrase to any of us. The subject has been talked about and written about ever since the first pictures were shown on screens. In most studies of the subject usually only one phase of film damage is covered, leaving the many others to subsequent articles, with the result that no complete picture of the subject has been given in a single presentation, such as is featured herein. No one phase of film damage is less serious than any other—all are equally important. They all contribute to the showing of a poor picture and shorten the life of the film. As every projectionist should be interested in putting on the best possible show it follows, therefore, that all should know how to guard against every phase of film damage, with each being covered fully in the accompanying article.

ALL film damage comes under two classifications: scratching and mutilation. Scratching of film may be due either to dirt or a sharp point or jagged surface coming in contact with the film. Dust can be found in every projection room and there usually is present oil vapor and air moisture. Either or both of the latter naturally are deposited on the film, thus any dust coming in contact with the film remains on it. Dust always contains a certain amount of gritty or abrasive material, so there is a nice abrasive coating on the film ready to scratch it when two surfaces of the film slide over each other or when the film slides through the projector on its way from the upper to the lower magazine. Jagged surfaces or sharp points need little if any clarification. If there are any sharp projections in the film path that the film may come in contact with, the film will be scratched.

Mutilation covers everything else that may happen to a film in the way of impeding its usefulness. Torn sprocket holes is the first example that will undoubtedly come to mind, it being all too common. Other examples are torn edges, splices opening resulting in film pile-up and damage, cracked film from too sharp bending, and warping and buckling of film. Torn sprocket holes usually are thought to be due only to hooked sprocket teeth or too great takeup tension. It is possible to weaken the sprocket holes by improper positioning of the film over the sprockets and then closing the pad roller or the gate. Here we have the possibility of the film being forced against the sprocket teeth and the edge of the sprocket holes being cracked. Then the next time the film is used there is the possibility of the sprocket holes being torn. If a sprocket tooth is allowed to become hooked the film will tend to become locked to it and follow it around the sprocket until the next sprocket or guide roller tears it loose. Something has to give and it will be the film.

All sprockets should be examined carefully and frequently and at the first evidence of the teeth becoming undercut the sprocket should be reversed, if possible, or a new one substituted. In case a new sprocket cannot be obtained try stoning the teeth, using a very fine carborundum block or its equivalent. Extreme care should be taken in this operation as the tooth contour has been very carefully determined for proper operation, and any appreciable change in the angles will affect the operation of the machine. By means of a suitable fixture it is possible to prolong the life of the sprockets considerably.

Preventing Torn Edges

Torn edges may be caused by bent reels or projections on the sides of the gates or pad rollers against which the film may rub. All reels should be inspected frequently and kept perfectly straight. In a similar manner examine the film path for any possibility of the film rubbing against any spot that will damage the edges. An accumulation of dirt or emulsion tends to cause trouble and should not be allowed to occur. Cleanliness is extremely important. It cannot be stressed too much.

Those of us who have been unfortunate enough to have a splice open up know how much damage can be done to a film. It will pile up in the most peculiar manner and take the most unusual configurations. As a result there is the possibility of torn sprocket holes, torn edges and cracked film. Film which has piled up should be examined carefully for all of the above possibilities. Sometimes cracks are not detected any too readily and require special watching.

Over a period of years film cement has been much improved and the technique of splicing film developed so that open splices were very rare up to the time that the war conditions made necessary changes in the manufacture of film. Reports have been circulated that war-time film is difficult to splice. In this regard the recommendations of the film manufacturers should be followed. However, it may be said here that if the proper amount of care is exercised in making a splice, there is no reason to believe that splices will open. This question of open splices has been brought up to emphasize the necessity for care in splicing and for special consideration of this essential part of operation for the duration.

Film Dries Out With Age

As film ages it will dry out unless definite precautions are taken to give it preventive treatment. Such treatment is being given those films that are being preserved for posterity in the various film libraries, and also in the case of those films which are preserving valuable records. As far as we know, such treatment is not used in the handling of regular theatre films. Therefore, as a film passes from theatre to theatre it becomes drier and drier. Thus it becomes more subject to cracking and in the drying process it has a tendency to warp and buckle. This process is accelerated by a dry high temperature. Therefore the temperature at the picture aperture determines how rapidly the film will dry out and how serious the warping and buckling will be. Manufacturers of projectors are very much aware of this action and the newer projectors give evidence of the consideration that has been given to this phase of design. How far the manufacturers will be able to go in decreasing the temperature at the aperture remains to be seen.

A warped or buckled film can cause a lot of trouble in a projector. For example, as it goes past the sound scanning point it must be in a certain definite relation to the scanning beam longitudinally and laterally. If it is closer to or farther away from the sound optic than it should be, sound quality will deteriorate. If it is displaced inwardly or outwardly, sprocket hole or frame line noise

may be encountered. The film is not going to warp or buckle in the same way or magnitude throughout its entire length. It will be worse at some points than at others, so we may say that the sound will be modulated by such a film and it will not be a desired modulation. Therefore it will be well nigh impossible to position such a film so that good quality will be obtained throughout.

You may say that the above applies only to badly warped or buckled film and that the film is positively guided at the scanning point. That is true but, after all, badly buckled film may occasionally be encountered after it has been run in houses not having up-to-date equipment. There also are instances on record where such film actually has forced open the guide roller or sound gate and so displaced itself. In fact, it not only forced the roller open, but actually has "jumped the track," so to speak. If the film happens to jump off a sprocket serious trouble might be encountered. The only cure for a warped or buckled print is to obtain another one.

Cracks in films, in general, are the result of rough handling. Films are not designed to be bent sharply, creased or kinked. If this happens only once the film definitely is weakened although it may not appear so to a casual observer. That is why we previously recommended the careful examination of any film that has been piled up in the projector for any reason. A good splice is much better than a weak film, so any such points should be cut and spliced. Evidence of creases or kinks occasionally may be found in film just received in the theatre, so in making up the show careful examination of the film may save trouble later on.

To get down to cases let us see how film damage may occur during the normal course of events after it is received from the exchange. First we have the making up of the show which involves rewinding and splicing. Theatre reels should be kept clean; that is, free from dust, grit and oil. We already have gone into the necessity for using only straight reels. In the rewinding, a uniform tension should be kept on the film. Otherwise, as the reel is wound there will be loose and tight spots which will tend to equalize themselves, which means that one layer of film will slide over the other. Even though the film is carefully cleaned to remove oil and dust particles, a certain amount will remain and the sliding of the film will produce scratches. These scratches should be small, but on the sound track may lower the quality.

Then the film is threaded in the projector and soundhead. Here many things can happen. If the upper magazine fire rollers and the upper feed sprocket and pad roller are dirty or clogged with emulsion we have the possibility of more scratches on the film in addition to torn edges or sprocket holes. The upper loop should not be too long or the slapping action against the upper part of the projector also may add to your scratches, and crack the film if it is old. You also may find that your fire shutter has dropped. The film slides through the picture gate with suitable guides, guide rollers and the guiding action of the intermittent sprocket. The frames and sound track are not in contact with any of the metallic surfaces if the gate and sprocket are clean. But suppose it is full of emulsion or a small piece of film has lodged in the gate? The film then may break or be deflected from its normal path so that it actually rubs against one side of the gate. Here we have more scratches in the making.

Film Damage in Soundhead

The lower loop between the intermittent and the lower feed sprocket again must not be any longer than required for proper operation or scratching and possible film cracking may occur. When the WE 211 type Reproducer Set is used a long loop may cause an unnatural bend of the film as it enters the film chute. With the WE Universal Base a film chute is also employed. Here the rollers tend to equalize the loop, but they must be kept clean or the same old troubles will appear.

In the soundhead itself we may encounter either the rotary stabilizer or the fixed gate type. In the rotary stabilizer type, a dirty felt roller on the guide roller assembly will scratch the picture. Remember that the felt roller rotates by virtue of the film being pulled between it and the stabilizer drum. It therefore rotates only by virtue of friction and so there is slippage. In the fixed gated type, the film slides between guides and tension shoes. The picture and the sound track do not normally touch the metallic surfaces, but the same precautions should be exercised as in the case of the picture gate above.

The sound and holdback sprockets in the soundhead may be the source of the same sort of troubles as the sprockets in the projector. The operation of the takeup is extremely important. It must be smooth in action and have sufficient tension to take up the largest reel of film used in the theatre. But if the tension is too great more than normal strain is placed on the film and the sprocket holes, the result being torn sprocket holes or maybe a torn film. Here again cleanliness is important. A dirty takeup cannot be expected to function smoothly; on the other hand, its operation probably will be jerky, which adds a very unnatural strain to the film.

If it seems that the picture portrayed above precludes the possibility of ever being able to run a film again after it has once been through a projector, this was far from the intention of the writer.

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Walter Green Urges Strict Compliance With WPB Regulations

THE need for one hundred per cent cooperation with the regulations of the War Production Board was stressed by Walter E. Green, president of National Theatre Supply, division of National-Simplex-Bludworth, Inc., in an address at the annual meeting of the Allied Theatre Owners of New Jersey.

The appointment of A. G. Smith as Chief of the Amusement Section, Service Equipment Division of the WPB, and Lester B. Isaac as Special Industrial Consultant to the Amusement Section was highly commended by Mr. Green. "The fine reputation of these two gentlemen," he said, "and their long and varied experience in this field is an assurance that regulations which affect all of us will be made and put into operation without fear or favor, that they will give a broadminded consideration of the greatest good for the greatest number. Confidence in such men gives valuable support to our government at a time when it is greatly needed.

"Time after time," continued Mr. Green, "theatre operation is dependent upon some small part, which we are able to supply, but can only do so provided formalities preliminary to obtaining that part as outlined by the government are fully complied with. Not to conform with what may appear on the surface to be seemingly unimportant regulation, causes delays and unnecessary embarrassment. If the regulation or restriction works a hardship, instead of ignoring it or failing to obey it, we ought to take immediate steps to correct it. But just so long as it is on the books and is known to everyone, strict compliance saves time and money.

"The job of WPB and its desire is to help you by regulation, not hurt you by unwise restrictions. The situation as applying to supplies and equipment parts is better and in my judgment will continue to improve."

Novel Crossword Puzzle Contest

I. P.'s Crossword Puzzle Contest, which started last month, brought in many favorable comments from readers, but several complaints were registered, the principal one being that some of the words were a little out of the ordinary. It was pointed out that some obsolete words called for the knowledge of an English professor to get them into the pattern.

Our Crossword Editor has taken the complaints to heart and in preparing the current puzzle has kept in mind the fact that a projectionist's skill does not call for an academic degree. We hope the result will be that more projectionists will get pleasure in solving the puzzle and in writing a short article on this month's question, which is printed in the box below.

Some comments received indicate that readers were able to write in the words related to their craft practically before one could say "WPB priority," but a few of the others, while in all the dictionaries, were the reason for some difficulties.

Crosswording is lots of fun and the fun can be made profitable for you as this series enables contestants to garner additional War Stamps for their collections. Five prizes will be awarded each month to those contestants who send in the correct answers *together with a letter not to exceed one hundred words on a topical question.*

Literary skill is not required to win a prize. The awards will be based on the practical manner in which the question is answered. Winners will be chosen by the editors of I. P., and their decisions will be final. In the case of ties, duplicate awards will be made.

When you have completed the Crossword Puzzle this month, write your letter answering the question below, and mail both to the Contest Editor, International Projectionist, 19 West 44th Street, New York 18, N. Y., postmarked not later than August 10, 1943.

July Contest Question

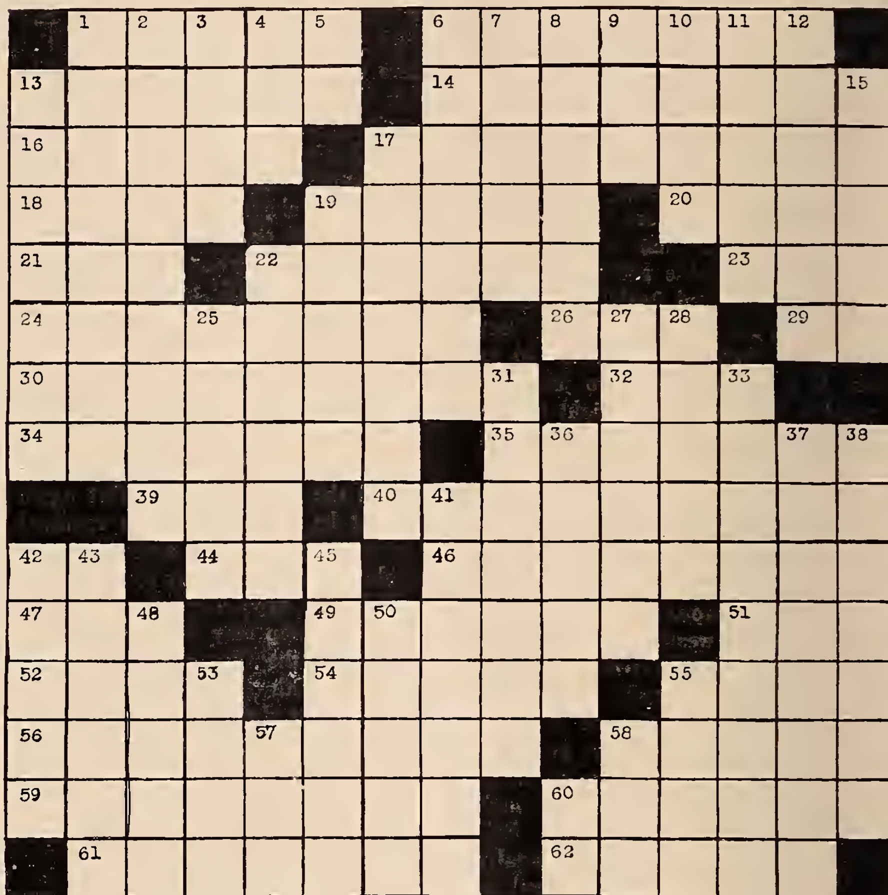
"Explain the difference between variable area and variable density recording."

THE AWARDS

First Prize—$10 in War Savings Stamps.

Second Prize—$5 in War Savings Stamps.

Third Prizes—Three awards of $2 each in War Savings Stamps.



DOWN

1. Pertaining to European Upper Cretaceous
2. Unprovided with cilia
3. Portico
4. Offspring
5. Year (abbr.)
6. Family of gulls
7. Ready (obs.)
8. Disordered
9. Very short Brothers (abbr.)
10. Suffix denoting a grove
11. Rustic
12. Stratagem
13. Negro with white blood
15. Chariot
17. Gilding leaf of metal (var.)
19. Piece of furniture
22. Burned
25. Masc. proper name
27. Philippine dialect
28. Delight (obs.)
31. Of exalted rank
33. Guard locks (two words)
36. Mid-days
37. The Japan Current
38. Tryer
41. Glints
42. Play
43. Givers
45. Flooded
48. A dance
50. Put in a row
53. First king of Israel
55. We (Fr.)
57. 901
58. Bachelor of business administration
60. About (abbr.)

ACROSS

1. West African tree
6. Unit of brightness
13. Mathematical instrument
14. Opening in partition
16. Negatively charged ion
17. Kind of relays
18. Syrian weight
19. Himalayan wild goats (var.)
20. Charts
21. Blackbird
22. Holy person (Fr.)
23. Port on New Guinea
24. North American herb
26. Accomplished
29. Neodymium (abbr.)
30. Payments of tax rates
32. Wager
34. Deficiency of nervous energy (ea)
35. Not alike
39. Damn
40. Father of Belshazzar
42. Doctor of Divinity (abbr.)
44. Latter-day Saints (abbr.)
46. Mean gazers
47. Spoil
49. Picket
51. African eye worm
52. Fresh water duck
54. Mohammedan religious teachers
55. Inquisitive
56. Single-rayed
58. German (slang)
59. Debate
60. Village in Egypt
61. Not hollowed blocks (Fr.)
62. Low male singer

(The solution to last month's puzzle will be found on page 25)

PREVENTION FILM DAMAGE

(Continued from page 17)

It may well be said that some of the troubles mentioned are remote. That is granted, but "an ounce of prevention is worth a pound of cure" and for that reason they have been included. Every projectionist undoubtedly was at one time thoroughly familiar with all of these troubles, but careful attention to the many operating details has prevented his being brought face to face with the dire results of poor operation and maintenance.

IN THE SPOTLIGHT

(*Continued from page* 15)

them with the "upturn" of business.

The then existing contract expired in September 1941, but the Schine people were "too busy" to meet with the union officials to discuss the restoration of wage cuts. Eventually they got together, and they recently signed a new contract giving Local 253 members an increase of 8%, but—and here is the punch—the retroactive pay only went back to April, 1943.

The moral to this, as we see it, is that no cuts should be granted to any exhibitor without a *written and properly executed agreement* stating that *all increases agreed upon when signing a new contract would be retroactive to the expiration date of the old contract.* The wily exhibitor usually manages to smuggle a smart attorney into the conferences with union officials, and unless these officials are themselves fortified with legal talent, they will find themselves behind the well-known 8-ball.

● In the name of the New York Central Trades and Labor Councils, of which he is president, Tom Murtha, who is also business agent of Brooklyn Employees Hands Local No. 4, presented a check for $634,000 to George Meany, secretary-treasurer of the AFL at a recent dinner held at the Hotel Commodore, New York City. This gathering was attended by over 1800 people, among whom were Supreme Court Justice Robert H. Jackson, guest speaker at the affair, and labor leaders from every industry in greater New York. Tom received a tremendous ovation when he addressed the guests, explaining that the check was to defray the cost of two bombers—one to be named the "Spirit of the AFL" and the other the "Spirit of the Central Union of New York."

● Shortly before this issue went to press word came through from Washington that the War Manpower Commission has finally awakened to the fact that the production of motion pictures will be of little help to the war effort without proper film distribution. Well, now that the production and distribution of films have been taken care of, how will they be presented to the pub' without the services of Mr. Projectionist, who is classified by this same WMC as non-essential to the war effort? They may, in due time, get around to that phase of the picture—we hope.

● A prominent film executive recently stated that the "peak attendance at motion picture theatres is due for a drop

(*Continued on page* 21)

P. A. SYSTEMS

(*Continued from page 8*)

be established which will minimize the possibility of feed-back. By means of a plan of the auditorium not only may the speakers be positioned for the least possibility of feed-back, but also for adequate coverage of the audience area.

In this connection, the speakers should be angled horizontally for full coverage, but with minimum overlap of the sound beams. It has been demonstrated that when the beams from two speakers overlap to any great extent an interference sound pattern is established which results in sound deterioration within the overlap area. It is better, therefore, to so position the speakers that the theoretical edges of their beams just touch at the far end of the audience area. This so-called coverage angle does not mean that sound is not heard beyond, but rather that the intensity has dropped to a point that the manufacturer considers the minimum for the particular type of speaker. There is, of course, some spill-over beyond and this can be counted on, generally, to provide adequate intensity in the center section of the auditorium.

The height of the speakers above the floor is also important. Here the vertical coverage angle of the speakers comes into play. This coverage can be plotted on a side elevation view of the auditorium and a height determined that will reach all parts, underneath the balcony and the last row of seats in said balcony. In a long auditorium the use of additional speakers located toward the rear may enter the picture. In this case, remember that electricity travels at the speed of light whereas sound is much slower. Therefore, any speakers located near the rear of such an auditorium will project sound into the audience area before the sound from speakers at the stage arrives at that point. The sound from the speakers at the stage then will produce an echo. When this echo first becomes perceptible, the sound appears blurred and then as the distance between the speakers is increased there is a very definite echo, which naturally is unpleasant. The use of auxiliary speakers is frowned upon unless the auditorium is exceptionally large or has some special configuration that may make them necessary. In such cases extreme care must be exercised in locating all speakers so as to minimize the echo situation.

The acoustic properties of an auditorium affect the quality of a p.a. system in the same manner as it affects the quality of a sound system. Large areas of hard walls, whether they be straight or curved, reflect sound, resulting in reverberation in the first instance, and reflections and echoes in the second instance. Curved surfaces act in the same manner as arc lamp reflectors and so concentrate the reflected sound waves at their focal points in the auditorium. Therefore, in such theatres the speakers should be so angled horizontally and vertically that the sound will not be reflected into the audience area.

A well designed and carefully installed p.a. system should give intelligible sound comparable with the speech or singing response of a theatre sound system. It does require the use of a properly coordinated system for the application rather than the assembly of a number of unrelated parts.

OFFER MICA CAPACITOR ALTERNATES

Aerovox Corporation, New Bedford, Mass., announces the introduction of ultra-small oil-impregnated oil-filled capacitors for use in assemblies where both space and weight are at an absolute minimum. These Type 38 oil tubulars, originally designed as metal-cased alternates for mica capacitors, now are being used for newly designed equipment. They are conservatively designed, meet all standard specifications for paper dielectric capacitors used as mica alternates, and many other of the exacting conditions to which the replaced mica capacitors are normally subjected.

IN THE SPOTLIGHT

(*Continued from page* 19)

after the war." That's food for thought. Is he building up a case for a cut in salaries and personnel when the war ends? According to these big shots, when a company shows a profit of say $15,000,000 for one year and only $14,-000,000 the next year, it is then operating at a loss of $1,000,000! The *deficit* of $1,000,000 must be made up some way, some how. No, they cannot reduce the salaries of their top-flight executives and movie stars—not with taxes and the price of nylons being what they are. The most likely victim is the old fall guy—the projectionist. Take a cut, they will say, just for a short period until conditions return to normalcy again (by normalcy they mean when their yearly profit will again soar to $15.00.000), at which time they will return the cut. Oh, yeh? It seems to us like an old familiar refrain. The only time salary cuts are restored is when ordered by the courts.

● The New England locals, comprising the Third District, deserve much commendation for their deep interest in the affairs of their district. Despite gas rationing, railroad tie-ups, and all the obstacles placed in the path of travelers, 49 local unions, out of a membership of 61, were represented at the meeting held in Boston last month.

The meeting was opened under the able leadership of I. A. Vice-President James J. Brennan, who acted as chairman, and Fred Newcomb, secretary of the Third District. I. A. representative Bill Scanlon, of Lynn, Mass., was among those present. Fred Newcomb was re-elected secretary of the district by acclamation. Lou Krouse, I. A. secretary-treasurer, addressed the delegation, and the only "outsiders" permitted to address the meeting were P. A. McGuire, advertising manager for International Projector Corp., Attorney Rower, and yours truly.

● The New York State Projectionists Association meeting was held last month in Utica, N. Y. We met many new faces there and quite a few old ones. Fred Boekhout, business agent of Local 253, ably assisted by Harry Brooks of Troy, N. Y., presided at the meeting. Glenn Humphrey, 10th District Secretary and business agent of Local 337 (Utica), addressed the assembled delegation in his usual authoritative manner and was roundly applauded. Joe Smolinski, president of Local 337, acted as official greeter and welcomed all the visitors.

Many timely topics were discussed at the afternoon and evening sessions and committees were appointed to carry out specific tasks. Many thousands of cigarettes, with the I. A. emblem on the wrappers, are to be distributed to the men in service with the compliments of this Association. I. A. vice-president James J. Brennan accompanied the writer on the train back to New York—and plenty hot it was.

● In the recent issue of District No. 1 Bulletin, J. W. Simeral, president of Local No. 613, Salem, Ore., writes of a most interesting situation that presented itself in his jurisdiction a short while ago. To wit:

"Warner Brothers have two theatres in our city. William Forman operates three houses. On October 2, 1942, Mr. Forman, acting also for Warner Brothers, negotiated and agreed to a contract with our

(*Continued on page* 26)

IF YOU ARE a projectionist between 25 and 40, married and of good appearance, who would like to enter the theatre equipment selling field after the war and are willing in the interim to do defense work for good money while learning the production of theatre equipment, write your qualifications to Box 103, INTERNATIONAL PROJECTIONIST, 19 West 44 St., New York 18, N. Y.

AT YOUR SERVICE

(*Continued from page* 13)

starts the grease is pushed away from the gears, and the gears run dry until the gear box gets hot and melts the grease. The oils and wax have now separated and the grease which has become sudsy like soap leaks out. Furthermore, the wax gets in the oil grooves in the 712 drive and plugs them up.

I have been using City Service or Gulf Heavy Pressure Gun Grease, which easily twines around the gears. When the gears turn they pull the grease in around them like a rope and away from the walls. I can take the big plug out of the 709 drive and the grease will not run out while the gears are turning, although I can see the grease rolling inside. I have found this stops some leaks and also cools the 712 drives. Even after running for several years, the gear boxes will be free from any crusts forming on the inside.—R. O'Toole, *RCA.*

Conservation of Exciter Lamp Terminal Board

The stock #21448 terminal board is used in the PS-21 soundheads of the PG-28, PG-59, and PG-70 sound equipments. This earlier type terminal board is constructed of black bakelite, and in some cases undue pressure on the exciter lamp bracket, when mounted on the studs, causes one or both corners of the bakelite panel to crack and break off. These broken panels can be repaired effectively with DuPont Household Cement, either by cementing the broken piece back in place, or, in case the piece is missing, by building up the missing area with the cement, allowing it to dry and building up again as contraction occurs.—C. R. Underhill, *RCA.*

Correcting Noisy Volume Control

From time to time high spots develop on Stackpole controls, causing noise at that point, and in some cases opening contact to wiper. This condition may be corrected by removing the cover and running a finger once or twice over the Stackpole resistance. This action will smooth the surface, and eliminate noise. Do not rub finger too hard on surface or resistor will be damaged. — H. E. Frisbie, *RCA.*

Emergency Operation of Sound System

When the MI-1500 power unit fails to operate, in connection with an MI-1500 exciter and field supply unit, I connect a permanent emergency switching arrangement that will join the 12 or 18-volt emergency battery-lighting system to the exciter and field units. These batteries are capable of 60 to 80 ampere hours, so they will serve as an emergency expedient until the engineer arrives to correct the fault. Most theatres have one of these emergency systems, and sound outages can be prevented by using this method.—A. W. Falcone, *RCA.*

Eliminating "Wows" on W. E. TA-7400 Soundheads

I recently received a complaint of "wows" in the reproduction of a W. E. TA-7400 Soundhead which was caused by the rotary stabilizer shaft binding or failing to rotate freely. The entire assembly was removed and the dried grease which caused the trouble was dislodged from the ball bearings.

In connection with this type soundhead, it may interest some service men taking care of such equipment to know that the stabilizer shaft housing can be oiled without removing either the housing or the projector mechanism. To do this, remove the four flat head screws in the flanged end of the housing back of the sound take-off drum, and rotate the

housing 120 to 180 degrees in the soundhead casting so that the two small screws in the top of the housing are near the bottom and can be removed from underneath the soundhead. The housing can then be turned back far enough to retain a small amount of oil squirted through the screw holes. Replace these two screws, turn the housing back to its original position and replace the flat head screws. — E. B. Douglas, *RCA*.

Tube Substitution on the Motiograph Sound System

The monitor amplifier tube WE-236-A. which is difficult to obtain, can be replaced with an RCA 6K6GT or G by simply changing the six-contact wafer socket to an octal type and adding a 10-ohm resistor in series with the filament circuit. The gain and power remain the same. — F. M. Armstrong, *RCA*.

Carbon Conservation

I believe word should be passed along that after the short carbons (positive) are burned down as low as possible. they should be inserted in the negative holder. If the holders are not big enough they may be slightly enlarged. There is a drop of approximately seven amperes in most lamp houses. The use of short positive carbons in the negative holder probably is well known, but I have found, however, a number of theatres not familiar with the substitution.— G. P. Knapp, *RCA*.

Emergency Operation of House Phones

Theatre house phones may be conveniently operated from emergency lighting batteries in many theatres. Connection is made from the negative side of the bank to the positive side of cell required to give the necessary voltage. In one theatre, I connected a booth phone (W.E. 1001M Hand Set) directly off the exciter lamp supply from TA-7276 power unit without any dropping resistor. Operation is entirely satisfactory and no filter was required to prevent interference with operation of sound system. A small cartridge fuse was placed in the positive side for protection from shorts or grounds in the phone circuits. Such provisions eliminate expense of battery replacements where theatre uses W.E. 1001M Hand Sets.—R. S. Sear, *RCA*.

Repairing Tungar Bulb Sockets

Tungar bulb sockets used in the MI-1520 and similar type power units can be repaired by replacing the copper socket shell with shells taken from a couple of porcelain lamp sockets used in the theatre. These shells may be used by cutting away their base so as to make a clearance for the yoke and bottom contact. Also, place one turn of #14 wire in one groove of the shell and solder the wire around it, soldering the other end of the wire to the yoke forming contact to the shell. This procedure eliminates the heat caused by loosening all the screws in yoke holding shell to base and forming the one contact.— A. D. Miller, *RCA*.

CONGRESSIONAL LIBRARY BEGINS COLLECTION OF FILMS

Requests have been made to United States motion picture producers by the Library of Congress to deposit in the Library 104 films and portions of films released from May 1, 1942, to April 30, 1943. Such films will be deposited under an agreement between the Library and the motion picture producers made in April, 1942, when it was decided that the Library was to select from among the films copyrighted in any given year those having documentary significance or having significance as records of the time.

It is hoped that eventually the Library will be able to add to its collections all significant motion pictures just as it now adds all significant printed publications, and the importance of the film to the record of American life is regarded as being obvious. However, at the present time the Library is compelled to restrict its selection of films because it lacks adequate facilities for the screening, cataloguing and shelving of large quantities of motion pictures.

Underwriters Code As It Affects Projection Rooms

IX

Instrument Transformers, Relays, Etc.

2621. *Instrument Transformer Circuits.* The secondary circuits of current and potential instrument transformers shall be grounded if the primary windings are connected to circuits of 300 volts or more to ground. and, if on switchboards, shall be grounded irrespective of voltage.

2622. *Instrument Transformer Cases.* Cases or frames of instrument transformers shall be grounded, except as follows:

a. Cases or frames of transformers used to supply current to instruments or protective relays, if they are isolated by elevation or guarded as required for the maximum potential at which they operate.

b. Cases or frames of current transformers, the primaries of which are not over 150 volts to ground, and which are used exclusively to supply current to meters, need not be grounded.

2623. *Cases of Instruments, Meters and Relays—Operating Voltage 750 or Less.* Instruments, meters and relays which operate with windings or working parts at 750 volts or less shall be grounded as follows:

a. Not on Switchboards. Instruments, meters, and relays not located on switchboards, which operate with windings or working parts at 300 volts or more to ground, and accessible to other than qualified persons, shall have the cases and other exposed metal parts grounded;

b. On Dead Front Switchboards. Instruments, meters and relays (whether operated from current and potential transformers, or connected directly in the circuit) on switchboards having no live parts on the front of the panels shall have the cases grounded;

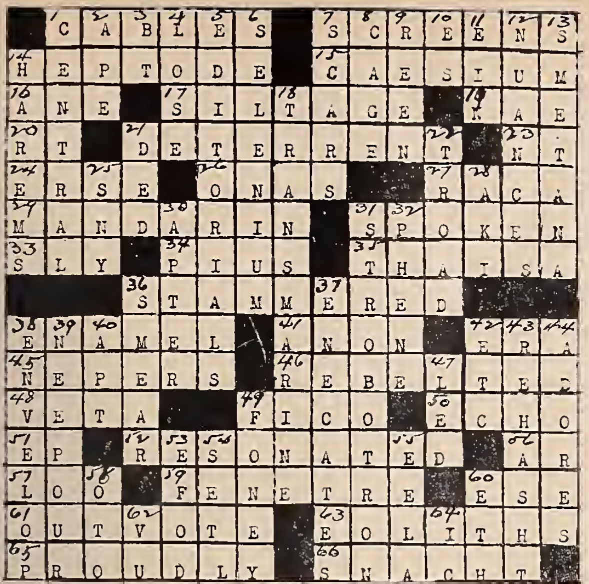
c. On Live Front Switchboards. Instruments, meters and relays (whether operated from current and potential transformers or connected directly in the circuit) on switchboards having exposed live parts on the front of panels shall not have their cases grounded. Rubber mats, or other suitable floor insulation, shall be provided for the operator if the voltage to ground exceeds 150.

2624. *Cases of Instruments, Meters and Relays — Operating Voltage Over 750.* Where instruments, meters and relays have current-carrying parts over 750 volts to ground, they shall be isolated by elevation or protected by suitable barriers, grounded metal or insulating covers or guards. Their cases shall not be grounded, except as follows:

a. In electrostatic ground detectors the internal ground segments of the instrument are connected to the instrument case and grounded; the ground detector shall be isolated by elevation.

2625. *Instrument Grounding Conductor.* The grounding conductor for secondary circuits of instrument transformers and for instrument cases shall not be smaller than No. 12, if of copper, or, if of other metal, shall have equal conductance.

(To be continued)



Solution to last month's Crossword puzzle

DISNEY DISPATCH ISSUED FOR WORKERS IN SERVICE

Walt Disney has done it again. His new house organ, "Dispatch From Disney," is a typical Disneyian gesture from cover to cover, and while it is published for employes in the services the contents are amply interesting to any casual reader.

Editorial material, art work, the format and production are 100 per cent and, we can believe, Disney workers who are scattered around the globe in this man's and woman's war, will become more than usually nostalgic when they thumb the pages of the "Dispatch."

● BUY WAR BONDS ●

RCA SERVICE AGREEMENTS RENEWED WITH FOX GROUPS

Agreements have been signed for RCA service to more than 300 theatres of the Fox groups, including Fox West Coast Theatres, Evergreen State Amusement, Fox Inter-Mountain Theatres and Fox Wisconsin Theatres. This is the eighth consecutive year the agreements have been signed, with negotiations being concluded by Charles P. Skouras and Frank S. Irby for the National Theatres Amusement Co., Inc., and E. C. Cahill and W. L. Jones for the RCA Service Co., Inc.

Mr. Jones, vice president and general manager of RCA Service Co., states that signing of the agreements for the Fox groups culminates a period of heavy contract renewal activity and interest in service by many other theatre groups and independents. He points out that loss of experienced projectionist personnel and material shortages have created added difficult problems for theatres.

Renewal agreements also have been signed recently with Fabian Theatres, New York; Alliance Theatres, Chicago; Floyd Theatres, Jacksonville, and Waters Theatres, Birmingham. Among the new agreements signed are those with Balaban & Katz Corporation, Chicago; Stein Theatres, Jacksonville; Schoenstadt Circuit, Chicago, and Morris-Legendre Theatres, Kannapolis, N. C.

Du MONT WILL BROADCAST FROM WASHINGTON, D. C.

A request for the reinstatement of a commercial television station application for Washington, D. C., has been filed with the Federal Communications Commission by Allen B. Du Mont Laboratories, Inc., with offices, laboratories and plants in Passaic, N. J. The station will operate on Channel 1, or 50,000 to 56,000 kilocycles.

At present Du Mont is operating a New York television station, W2XWV, on a schedule program basis. Leading advertisers, advertising agencies and broadcasters interested in post-war telecasting are taking part in the experimental activities.

Du Mont-built equipment will be available for the Washington station, just as such equipment was built and installed in the New York station.

WHAT IS DORMANT SCRAP?

Obsolete machinery, tools, equipment, dies, jigs, fixtures, etc., which are incapable of current or immediate future use in the war production effort because they are broken, worn out, irreparable, dismantled or in need of unavailable parts necessary to practical re-employment.

FOLLOW THIS RULE

If it hasn't been used for three months, and if someone can't prove that it's going to be used in the next three—sell it*—or scrap it!

***Scrap and used equipment dealers pay well for usable machinery and materials.**

IN THE SPOTLIGHT

(*Continued from page* 21)

secretary, L. G. Mitchell, and Representative Jacobson. The effective date was October 4, 1942. Form No. 1, asking the Wage and Hour Division to rule on whether the contracts needed War Labor approval, were filed. The facts presented included that we are considered as SALARIED employees. Remember—the dates in both agreements are the same. The increases in both cases are identical, except for a second increase at Forman's Grand, effective January, 1943. Here are the rulings received from the Wage and Hour Division:

"The Forman contract, except for the second increase referred to, does NOT need WLB approval. The Warner Brothers contract MUST go to the WLB. According to the Wage and Hour Division, the employees working for Mr. Forman are salaried workers. The Warner Brothers contract must go to the WLB because our members are wage earners."

Although we can understand Simeral's bewilderment at such contradictory rulings, we are not at all surprised, having heard of many similar cases. Ask the I. A. office to tell you of the ruling given in the case of the Wardrobe Union.

TODAY WE ARE training some men to sell theatre equipment in the postwar period. We will add to this group a few projectionists who aren't afraid to work in a defense factory for good wages while learning sales work. Apply to Box 105, INTERNATIONAL PROJECTIONIST, 19 West 44 St., New York 18, N. Y.

SANDS AN AVIATION STUDENT

Angelo Sands, member of Local 316, Miami, Fla., is studying radio maintenance at the Embry-Riddle School of Aviation in order to prepare himself for work in that field with either the army or navy. Mr.

Sands, sound projection operator for the Wometco Theatres in Miami for the past 17 years, is attending school in the daytime and continues his work as projectionist in the evenings.

• BUY WAR BONDS •

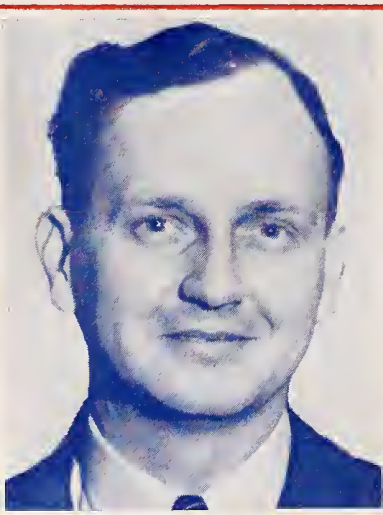
TANGIBLE EVIDENCE *of* I. P. READER *Loyalty* and *Support*

(Just a few of the larger checks received in payment for bulk subscriptions to I. P.)

THIS IS NUMBER 11 OF A SERIES OF ADVERTISEMENTS SPONSORED BY THE INTERNATIONAL PROJECTOR CORPORATION MANUFACTURERS OF *Simplex* EQUIPMENT IN COOPERATION WITH THE NATIONAL CONSERVATION PROGRAM

"Care of Theatre Equipment Important Factor in Speeding Victory!"

—*says* CHARLES HORSTMAN



CHARLES F. HORSTMAN
SUPERVISOR OF SOUND AND PROJECTION
R.K.O. THEATRES

"IMPORTANT INDEED is the motion picture theatre's part in America's gigantic war effort, that of helping to keep the morale of the armed forces and the home front always on a high plane.

This part can most effectively be played by continued maintenance of our plants in perfect order and by accomplishing this end under wartime restrictions and economy.

Never before has it been so necessary for the projectionist to be ever watchful over his precious equipment. Never before has it been so vital that he conserve, salvage and eliminate waste in his essential job of putting on the show.

In my opinion *the care of theatre equipment is a mighty important factor in speeding victory!"*

Chas F. Horstman

NATIONAL THEATRE SUPPLY COMPANY

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

Simplex

INTERNATIONAL PROJECTOR CORPORATION
90 GOLD STREET, NEW YORK, N.Y.

INTERNATIONAL

PROJECTIONIST

AUGUST 1943

VOLUME 18 • NUMBER 8

25c A COPY • $2 A YEAR

TANGIBLE

EVIDENCE

of I. P.

READER

Loyalty

and

Support

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

C. F. Alexander, *Technical Editor*
W. L. Lightfoot, *Associate Editor*

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YEARLY SUBSCRIPTION: United States and possessions, $2, (two years, $3); Canada and foreign countries, $2.50. Single copies, 25 cents. Changes of address should be submitted two weeks in advance of publication date to insure receipt of current issue. Entered as second-class matter February 8, 1932, at the Post Office at New York, N. Y., under the act of March 3, 1879.

Monthly Chat

THE government, industry and individuals have worked out many post-war plans that are designed to increase living standards and, all around, make this a better world in which to live. This is well and good and to the credit of those who are hopeful that the approach to Utopia will be more rapid after victory is won. But all these plans will fall short of their ends unless we all pitch in and aid in the work. Post-war planning will be successful only if everyone joins in, and the Golden Rule will be paramount if success is to be achieved.

• • •

In the June issue of I. P. the first of a series of word portraits of individuals was published. I. P. is pleased with the many good messages that have been received with reference to the feature, which will be continued in cooperation with its readers. If you know of anyone who you feel deserves recognition of this sort, send in an outline of his biography, being sure to include the important facts right to date, as well as a photograph. And we suggest that no undue modesty be shown by excluding yourself from the list.

• • •

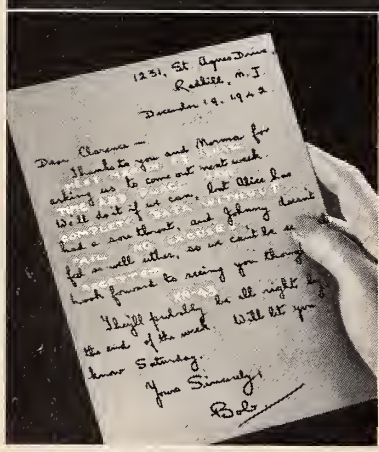
Electronic apparatus now is being used to determine and measure the vibrations of rotating machinery and it is carried on while the equipment is at rest. Mechanical vibrations are applied to the unit under test by a device similar to a dynamic loudspeaker coupled mechanically to the unit. The energizing power is capable of being varied in frequency from 30 to 20,000 cps. A crystal detector is applied to the unit to receive the vibrations and convert them into electrical energy. This energy then passes through an amplifier and thence to an oscillograph.

On the screen of this oscillograph the amplitude and frequency of the vibration may be measured. The detector may be moved at will on the unit to catch the peak vibrations and thereby obtain an accurate, comprehensive picture of the vibrations. This method is of particular value because the studies may be carried on with the unit at rest and it has been demonstrated conclusively that these results are directly comparable with results obtained under actual operating conditions. While first applied to large turbine wheels there is no doubt that its application can be extended to many other products.

• • •

Just a parting thought. This is your magazine and if you have any ideas or suggestions that you think may benefit the craft, just send them along.

(These pictures illustrate methods used—have no connection with actual enemy spy activities)



A CASUAL LETTER loses its "innocence" when a Kodak film, with the aid of ultraviolet rays, discloses the real message—in invisible ink.

BURNING an incriminating document no longer safeguards an enemy agent —Kodak Infrared Film makes fragments of charred paper readable.

SPIES' MEETING PLACE ... To get evidence that will convict, investigators may conceal a Ciné-Kodak in an adjacent room, make thousands of feet of movies of such "business conferences" as that shown here. How the Ciné-Kodak is sound-proofed and arranged to "see" through an innocent-looking wall . . . and other photographic details necessary for satisfactory results . . . can't be told now.

"SECRET AGENTS" not so Secret to Kodak's special-purpose films

"MUGGING" the criminal—taking his picture "full figure, full face, and profile"—is the widest use of photography by the police. That's useful—after he's caught.

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INTERNATIONAL PROJECTIONIST

VOLUME XVIII AUGUST 1943 NUMBER 8

The Electron Multiplier in Sound Reproduction†

By *F. J. G. VAN DEN BOSCH, D.Sc.**

A British scientist describes in detail electron multiplier tubes he has developed to take the place of the conventional amplifying tubes; and electron multiplier photoelectric cells to take the place of the conventional photo-cell and pre-amplifier. These he calls thermionic Augetrons and photo-Augetrons, respectively. Advantages claimed are more favorable signal noise ratio, and practicable voltage amplification up to 10,000 in a single multiplier tube.

RESEARCH work has for the last ten years been so concentrated on electron emission that it is a very great field to cover in a short paper. I propose discussing only a device recently developed in this country: a secondary-emission tube which is capable of practical use, and is in no sense a mere laboratory instrument.

In the early days of amplifying tubes, manufacturers experienced much trouble with what they called grid emission. It was found that this was actually a secondary emission by the grid, when bombarded by the primary electrons from the cathode. Therefore, they carried out research work to suppress this secondary emission; from their point of view it was a nuisance.

Instead of suppressing it, research has been carried out in order to make use of that emission. Let me first give an instance of its occurrence.

Principle of Secondary Emission

Suppose that in a tube there is a cathode and an anode, the latter at a potential of say 150v. If a second anode is added, also at a potential of 150v., the emission will remain the same; there is no gain in using a second anode. If, however, the voltage on one of these anodes be increased to 500 or 600 volts, the meter on the other anode will show a negative reading, and the current on the first anode will be the sum of the original current and this negative current.

Emission of secondary electrons takes place under the bombardment of primary electrons. The secondary emission factor is expressed as the number of electrons emitted by one primary electron.

This secondary emission can be increased or decreased according to the voltage. A maximum is reached at a speed of the order of a few hundred volts, the factor thereafter dropping almost to unity for a primary speed of several thousand volts. The explanation of this fact is that with low voltages the incident electron loses its energy near the surface, and the produced secondaries have not to travel far in the material before escaping; in the case of high voltages, the incident electron penetrates farther into the metal, and although the number of secondaries produced is actually greater, their relative individual energies are not enough to allow them to escape from the metal.

There are actually four controlling factors in the emission of secondary electrons: (1) *Electron Velocity*, (2) *Angle of Incidence*, (3) *The Material of the Surface Layer, and* (4) *The Smoothness of the Surface.*

If the anode is disposed at an angle, the secondary emission will be greater than if it were normal to the incidence of the electrons. This point is made clear in Figure 1; when an electron strikes the anode it penetrates it a short distance; the liberation of electrons will occur chiefly near the surface. Thus, if the target is inclined in respect to the source of electrons, there is a greater area near the surface of the anode from which electrons will be released.

The angle is, however, rather critical; if it is too acute, elastic collision may occur, resulting in a total absence of secondary emission. An angle of from 30 to 60 degrees is most efficient.

The third factor is the material of the surface layer. If the surface is of nickel,

† Journal of the British Kine. Soc., Oct. 1942.
* Sr. Physicist, Vacuum Science Prod., Ltd.

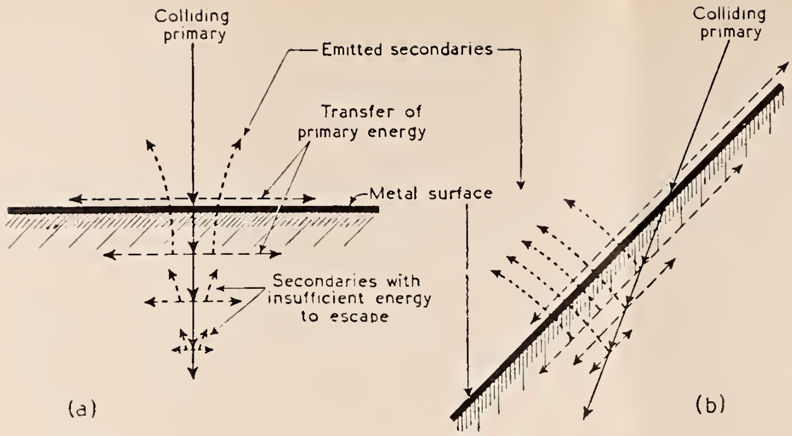


FIGURE 1. ***Effect on secondary emission of perpendicular and angular collision.***

the secondary emission will be small. But by coating the anode with metals such as caesium, barium or potassium, a considerable increase of emission will be shown.

We use caseium or barium because they have a very high secondary emission factor. But these materials are better emitters when they are contaminated. Most secondary emitters are photo-sensitive; for an efficient photo-sensitive surface a layer of pure caesium or potassium is essential. But such pure surfaces are not such good secondary emitters. Experience has proved that in the case of caesium secondary emitters, it is better to reduce the photo-sensitivity to a minimum in order to reduce the "dark current" to a minimum, and to obtain stable tubes.

Our fourth factor is the smoothness of the surface. If a surface is perfectly flat electrons are emitted evenly. But electrons are very small, and the surface is never perfectly smooth, and electrons produced in the cavities if they have not sufficient energy will stay in the cavity because of the cathode potential at the edges of the cavity. Therefore the smoother the surface the more electrons will be emitted.

Types of Multipliers

The next problem is how can one best build up a photo-multiplier, or other type of multiplier. In the original form, the electrons were directed by a magnetic field to the targets, disposed at a suitable angle. Zworykin employed electrostatic deflection and magnetic focussing. In the case of caesium, the maximum secondary emission obtainable is 12, and an average figure is 8. Such multipliers are very sensitive scientific instruments; however, they need an external magnet. It is preferable not to have outside influences such as magnets.

The German inventor Weiss made a multiplier with grids, which consisted mainly of fine silver mesh. It is fairly sensitive, but loses much emission through some of the primary electrons going straight through the holes of the grid. The mesh is rather fragile and liable to burn out. The voltage required is comparatively low—100 to 150 volts per stage. It still is a scientific instrument.

We have designed a multiplier which does not have the disadvantages of the Weiss, and which has the advantage over the Zworykin of not requiring external magnets; furtherfore, it will stand up to overloading and rough handling.

Our secondary emitting plate has perforations in the form of funnels, so that the primary electrons will always strike at an angle. A flange on the plate develops a field, which provides some degree of focussing, stage by stage. Apart from the openings, the whole plate presents an inclined surface to the electrons.

An important feature of the Augetron is the equi-potential grids. Consider a multiplier in which three secondary cathodes have respective voltages of 300, 600 and 900; an electron impinging upon the second cathode is submitted to two opposite fields, that from the first cathode of 300 volts negative, while the net value of the field of the second cathode is 300 volts positive, assuming perfect penetration. Unless, therefore, the produced secondary electron has sufficient kinetic energy, it will simply return to the cathode, being thus "neutralized."

If, on the other hand, we place a grid before each cathode, connected to its own cathode, we shall create an equipotential field between the grid and the cathode; emitted electrons will be no longer subjected to the negative field from the preceding cathode, while the positive field developed by the third, 900-volt, cathode will penetrate into this field, accelerating the produced secondaries.

In the Augetron, these grids consist of perforated nickel discs. In each grid, the perforations are aligned with those of the preceding secondary cathode, and staggered with those of its respective cathode.

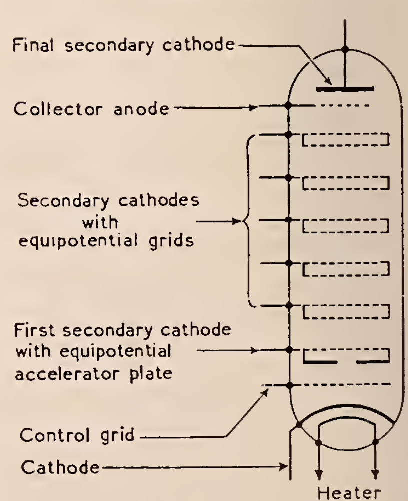
Thermionic Electron Multiplier

In the thermionic electron multiplier, the part emitting the primary electrons comprises the same elements as those of an ordinary amplifying tube, i.e., cathode, grid, and anode. The mutual conductance of this section is simple and straightforward, and has a ratio of 3:1. The current is of the order of microamperes, and is subsequently multiplied; in doing this, we also multiply the mutual conductance, which can attain in certain circumstances the value of 600 milliamperes per volt.

A feature of this tube is its adaptability to high-frequency amplification, due largely to its low input and output capacitances. A limiting factor for high-frequency response is the time of transit of the electrons through the tube; when this becomes comparable with a quarter of the period of one cycle, considerable loss of output will ensue. A five-stage Augetron has been specially designed as a high-frequency amplifier; its mutual conductance is 25 milliamperes per volt. For audio and intermediate frequencies, the six-stage Augetron (Figure 2) is of chief interest. Its mutual conductance can be made 600 milliamperes per volt or even higher, if the external circuit be sufficiently stable.

The Photo-Augetron consists of a pri-

FIGURE 2.



Arrangement of electrodes in Augetron.

mary photo-cathode, enclosed in a metal structure, which shields the primary photo-cathode electrostatically from the secondary emission assembly. The principal advantage of the photo-electric multiplier is the low noise level. In the case of a photo-cell and an amplifier the total noise is due to the cell noise, plus the coupling resistance noise, plus the amplifier tube noise. The second and third are avoided by the photo-multiplier. The average value of photo-cell noise is 15 microvolts—the noise of a coupling resistance may be as many millivolts.

The Augetron is constructed to run at a voltage of 300v. per stage; the five-stage Augetron may be run at 400v. per stage. While the tube will operate at voltages as low as 100v. per stage, such low voltages are not advantageous.

Power supplies can be divided into three groups: first, the standard high-voltage supply using one rectifier; two, the "combined" power supply using a high voltage with low current and a high voltage of lower value but higher current, and putting these both in series; and third, the power supply where the primary is fed from a d.c. supply such as a storage battery.

For the first, an ordinary rectifying and smoothing circuit (either of the voltage-doubler or the straightforward type) can be used. The "combined" supply is shown in Figure 3; the potential divider formed by the resistances *R-2* and *R-3* may not be required where supplies of 250 and 350 or 400 volts are already available. The third system may be used where a.c. power is not available, the primary of a vibrator circuit being fed from a 6-volt storage battery.

The suggestion may be made: why not build a multiplier large enough to dispense altogether with amplifying tubes? It has been found, so far as a commercial article is concerned, that best results are obtained with a photo-multiplier when the amplification has an average value of 10,000. If the multiplication is too high an additional noise is created termed thermal agitation, which provides a definite limiting factor. There is thus an optimum value of multiplication.

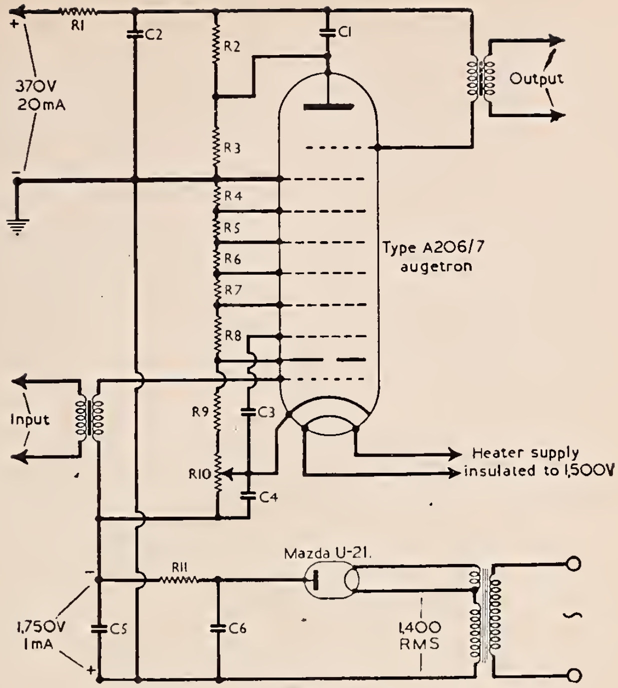


FIGURE 3.

"Combined" power supply.

We have made multipliers with an amplification factor of 2½ million; but they are not practicable to use. Therefore we use a photo-multiplier followed by thermionic multiplier, which gives the amplification needed with the highest signal/noise ratio. As an instance of the application of such cells, I have developed a film phonograph (Figure 4). There is no background noise whatever.

DISCUSSION

Question: What is Dr. Van Den Bosch's view in regard to the commercialization of the tube, particularly in regard to the motion picture industry?

Author: As you have seen, the unit is easily adaptable to the British Acoustic sound-head, used in my demonstration. In the ordinary sound-head you have a photo-cell and a pre-amplifier, and then you feed back to your main amplifier; here you can have one tube in the sound-head and fewer tubes in the final amplifier, because you have all the gain you need, with a very high signal/noise ratio. There is no disturbance from the gas filling which in the photo-cell creates additional noise.

Question: Will you be able to use a multiplier alone, with no further tubes?

Author: We are trying to develop a loudspeaker which will take the 1 watt which a multiplier will deliver. It is possible to increase the voltage above 1,800 v. by using special components, so increasing the output. Tubes have been made with an output of 2½ watts. Another point is that when feeding into a push-pull stage, the preceding stage of the multiplier is in opposition to the output stage, and therefore you do not need the phase changer.

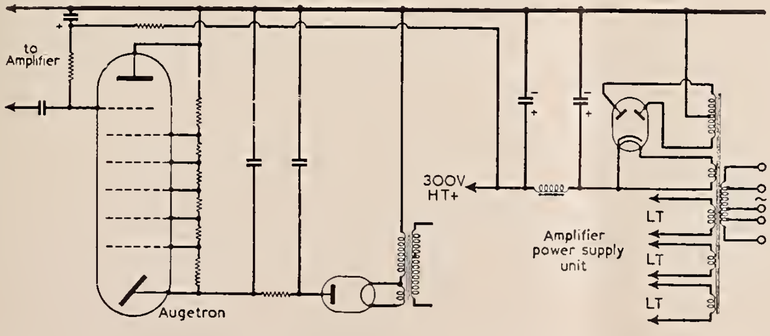


FIGURE 4. *Circuit of film phonograph amplifier employing Photo-Augetron.*

EQUIPMENT DEALERS WILL MEET IN CHICAGO SEPT. 17-19

The Theatre Equipment Dealers Protective Association will hold a meeting at the Bismarck Hotel in Chicago, September 17-19. This meeting is to be held for the purpose of mapping plans whereby equipment dealers and manufacturers may keep the theatres of our country supplied during the war period with the equipment necessary to keep them operating.

Ray G. Colvin, secretary of the Association, announces that with the cooperation of Allen G. Smith, Chief of the Amusement Section of WPB, he expects this to be the most largely attended meeting ever held by the industry.

JEFFERSON SIGNS WITH ALTEC

C. J. Zern, of the Altec Service Corporation, has completed a deal whereby the company will service the fifty-six theatres in Texas of the Jefferson Amusement Co., Inc., whose headquarters are in Beaumont.

Analysis of a Preview Theatre System

By *LEROY CHADBOURNE*

THE term preview as applied to films indicates a showing of the film in advance of its general release. There are a number of theatres throughout the country where new films are shown to unsuspecting audiences, prior to their advertised release, in order to obtain public reaction and to enable the producer to pass final judgment on the picture. As a result of this preview, a reediting of the film may be undertaken. In still other theatres, it is customary to rehearse the complete new show before its advertised showing. This may take place after the final showing of the outgoing picture and before the same audience, or just for the benefit of the theatre executives and personnel.

In any case, one of the purposes of the preview is to determine the level at which the picture should be run. It is well known that the producer attempts to record the picture at the proper level so that once the fader is set at the beginning of the picture, resetting will not be necessary during a reel or subsequent reels of the feature.

While the mixer men in the studios have become experts at establishing proper levels it cannot be expected that the sound will be the same in all theatres. The studios have been carefully designed for excellent acoustic properties, while only the newer theatres are approaching this optimum condition. The result is that certain frequencies predominate in some theatres while in others an entirely different band is peaked. It is to be expected, therefore, that some adjustment of the fader setting during the running of the picture will render the showing more pleasing to the audience. We all have heard loud passages in a picture that actually affected the ears, and other passages in the same picture that were so low in volume that the dialogue was inaudible—and there had been no change in the fader setting.

Cues Are Important

A preview, or rehearsal if you prefer, of the picture would have established cued fader settings, which if adhered to during the showing of the picture, would have vastly improved the performance. These cues should be obtained by a trained observer in the auditorium. It has been well established that the projectionist in the booth does not have the time and cannot judge accurately, the level in the auditorium.

The most practical method of obtaining adequate cues is for the observer to have control of the system volume or level, since the customary procedure of buzzing the booth for more or less volume involves a delay and an uncertainty as to the ensuing fader setting. If this observer does have such a volume control, he can immediately adjust the volume as required and record the setting and the cue so that during the several public showings of the picture the levels will be such as to give the most pleasing performance.

Auditorium Volume Control

This auditorium or remote volume control may be said to be the essential difference between a standard theatre system and a preview theatre system. In some of the preview theatres, however, equalizers have been provided, which permit the observer to change the frequency response of the system. Here again this feature may improve the performance, but its main purpose would be to provide the studios with additional information in regard to the equalization necessary for best results. It is, therefore, in the class of a laboratory instrument rather than a practical operating device.

This discussion will be confined to the system employing merely an auditorium volume control. Preview systems may be divided into two general classes; one having the booth fader common to both machines and the other having a fader in each pre-amplifier or voltage amplifier on the front wall.

In systems having a booth fader common to both machines, the only extra equipment for a preview system would be another fader identical electrically to the booth fader, but mounted in a suitable portable box, and a transfer key. It is customary for the observer to hold the auditorium volume control in his lap; hence it should be designed with this in mind. Occasionally a permanent installation may be desired and, accordingly, the design should be such that permanent installation may be readily arranged.

Another desirable feature is a luminous dial for the fader, since it will be used in a darkened auditorium. The circuit from the auditorium to the booth should be carefully shielded to avoid any possibility of pickup. For portable use, the box is usually equipped with a shielded cord and suitable plug.

Operation of the transfer key transfers the control of the system volume between the auditorium and the booth. If, just before the transfer, the observer at the location to receive the control is advised of the setting of the other fader, he can preset his fader and when the transfer is made there will be no difference noted. In some cases, depending upon the impedance of the circuit and the length of the run from the booth to the auditorium, the capacity of the run may affect the frequency response of the system. This can be compensated for by introducing a suitable equalizer.

The Link Circuit Amplifier

A block schematic of a preview system having a fader in each pre-amplifier is shown in Figure 1. Note that an additional equipment item, designated as a Link Circuit Amplifier, is required. We also see the auditorium volume control connected to the link circuit amplifier. This block schematic shows only the speech circuits. The exciter lamp and plate supply circuits would be no different from any standard sound system. Likewise energized or permanent magnet speakers may be used on the stage.

While all of the equipment in the preview system, except the Link Circuit Amplifier and the auditorium volume control, may be said to be standard theatre sound system equipment it should be stated here that the operating re-

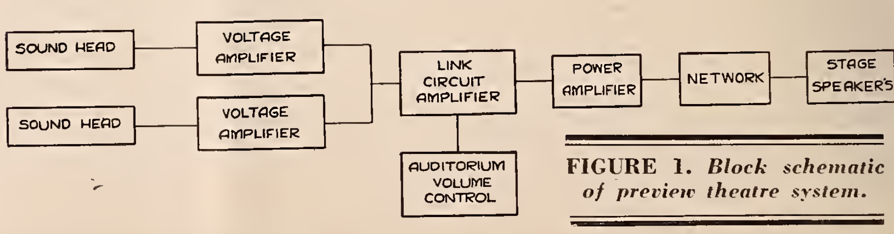


FIGURE 1. *Block schematic of preview theatre system.*

quirements, as dictated by the management are more stringent than in the average theatre. Before every preview the system is very carefully tuned up so that optimum quality is obtained in the theatre. It must be at peak efficiency.

Single Stage Amplifiers

The schematic of the Link Circuit Amplifier is shown in Figure 2. Filament and plate supplies are obtained from the system power amplifier. Two single stage amplifiers are included, only one being used at a time, thus providing an emergency feature. Note that the output and one side of the filament of each tube are connected to S-4. When this switch is thrown to the left, in the figure, VT-1 is in use and when thrown to the right VT-2 is in use. The grids of both tubes are connected in parallel and to point "C" on R-3.

In series with each grid is a resistor-capacitor mesh, which passes the higher frequencies, but attenuates lower frequencies. As far as the tube circuits are concerned a high end rise is to be expected, but this mesh is provided to compensate for high end losses in the transformers and is so arranged that the frequency response of the system is the same whether the amplifier is in or out of circuit. Capacitors C-3, C-6 and C-4, C-7 are 10 mf. and 8mf., respectively, and are for filtering purposes.

Switch S-1 is provided so that the amplifier may be totally disconnected from the circuit. In the left hand position, the input to the amplifier and the output of the amplifier are connected together. In the right hand position, the input is connected to the primary of T-1 through C-1, while the output terminal is connected through S-4 to the plate of one of the tubes. The secondary of T-1 and the primary of T-2 are connected to switch S-3 and in the position shown they are connected to the input and output of P-1 respectively. P-1 is a 500 ohm constant impedance T-pad located on the cover of the amplifier. It consists of thirty steps of one db each.

When S-3 is thrown to the left, auditorium position, similar connections are made to an identical T-pad volume control located in auditorium volume control. Since the run to the auditorium is so much longer, a loss of high frequencies would be expected due to the capacity of the shielded cables used. But this may be compensated for by connecting capacitors, equivalent to the capacity of the cables across the input and output of the volume control in the amplifier cabinet. Terminals 1, 2, 3, and 4 in the schematic are provided for this purpose.

While transformers T-1 and T-2 are well shielded, the amplifier should not be located close to any electrical device having an a.c. field that might cause pickup. In case such a condition does arise the transformers may be rotated to minimum pickup position. R-1, R-2 and R-3 are connected in series across the secondary of transformer T-2. They provide two steps of gain adjustment.

Provision for Auxiliary Inputs

When the grid is connected to point "C" the attenuation is 6 db. At point "B" it is 5 db and at point "A" there is, of course, no attenuation. The maximum gain is 21 db, but when the volume control is set on step 15 and the gain attenuator on point "C" the gain is zero. Thus, under these conditions, the system functions as a standard sound system with no effect on gain or frequency response.

By means of switch S-2 another feature is added, that of providing for the use of auxiliary inputs, either microphone or phonograph. For direct connection, the auxiliary inputs must have a 500 ohm impedance; for other impedances, coupling transformers are required. The method of operation is self-evident. There can be no superimposition of one input on another as switch S-2 permits the selection of only one input at a time. It can readily be seen from the above that the amplifier cabinet should be located in the booth where the controls are accessible and convenient. This location will be dependent upon the operating procedure in the particular booth.

(*Continued on page* 18)

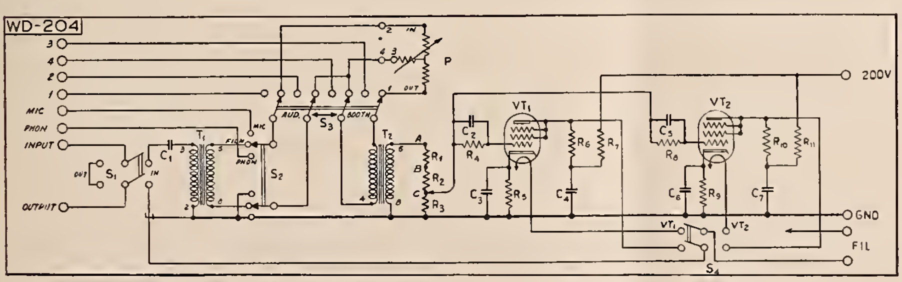


FIGURE 2. ***Schematic of link circuit amplifier.***

Introducing: Edward Whitford

EDWARD WHITFORD. Born in Syracuse, N. Y., October 8, 1908. Obtained his first job as motion picture projectionist in 1925 and joined Syracuse Local No. 376 in 1928. Worked as projectionist in practically every theatre in Syracuse, Rochester, Rome, and Utica—in the latter city he worked as chief projectionist in eight theatres every week, a different theatre each night and two on Saturdays. In recalling those early days, Whitford speaks of his first week as a nightmare, but finds the experience gained invaluable to him in his work.

Elected corresponding and recording secretary for Local 376 in 1941, which office he still holds. He is at present employed at both the Rivoli and Elmwood Theatres in Syracuse, acting as chief projectionist at the Elmwood Theatre since 1937.

In his spare time he overhauls projector mechanisms for the Altec Service Corporation and for local exhibitors. His hobbies are making mechanical and electrical devices, and motion and still photography. (Also has a secret yen to become the O. Henry of the craft—although his brain creations usually wind up in his wastebasket instead of on a publisher's desk.)

Whitford's ambition is to become projection supervisor for a circuit of theatres—his past experiences in the field plus his thorough knowledge of practical projection make him specially qualified to fill such a spot. Despite the fact that he is married and the father of four children he still retains his swell sense of humor. What a guy!

This is the second in our series of who's who in the projection world. From time to time I. P. will present to its readers brief word portraits of leading figures in the craft.—Ed.)

Film Distortions: Their Effect Upon Projection Quality†

By *E. K. CARVER, R. H. TALBOT* and *H. A. LOOMIS*
EASTMAN KODAK COMPANY

THERE are several types of film distortion commonly observed in processed film in the trade. Of these the most important are curl, spokiness, embossing, flute or long edges, and buckle or short edges. They are all caused by expansion or contraction, stretching or shrinkage, of certain portions of the film.

Curl.—Curl has come to be an accepted fact and is ordinarily without importance in projection except when it becomes excessive. It is ordinarily caused by shrinkage of the gelatin emulsion at low humidities, when it is known as front curl, face curl, or positive curl. When the emulsion has swelled at high humidities or the base has shrunk, so as to make the emulsion side convex, the curl is called back curl or negative curl.

Spokiness.—Spokiness is a phenomenon observed when film with a high degree of curl is wound with insufficient tension to keep the roll perfectly round. The explanation appears to be as follows: A plane sheet of material can easily be bent or curled in one direction or another, but strongly resists bending in two directions at the same time. Thus when a strip of curly film is wound into a roll, there is a tendency for each layer to resist bending for part of a turn and then to bend sharply.

As successive layers are wound on, each break reinforces the last until a definite hump has been formed. There will be a succession of these humps around the roll giving a characteristic appearance when the roll is viewed from the side. The successive humps appear as radial lines, somewhat like the spokes of a wheel. Such rolls are referred to as being "spoky."

Sometimes, due to the fact that the rolls appear polygonal rather than perfectly round, they are referred to as square, octagonal, or hexagonal rolls, regardless of the exact number of sides of the polygon. A spoky roll is shown beside a smooth roll in Figure 1.

Spokiness occurs both with 35mm and with 16mm film but does not appear to cause projection difficulties with 35mm film. With 16mm film, possibly because there is greater tendency for the spokes to "set" in the film, or possibly because of the lower pressure on the gate shoes in the projectors, in-and-out of focus effects are sometimes produced by the film distortion resulting from spokiness.

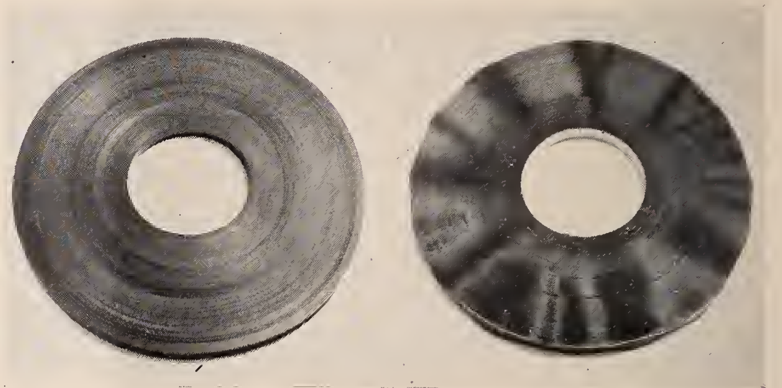
Spokiness is generally the result of overdrying in processing, resulting in film of high positive curl, and of loose winding, which allows film of high curl to spoke more readily. We must choose, therefore, a middle course between overdrying and underdrying. The former may result in focusing difficulties as a result of spokiness; the latter may give thermal "in-and-out of focus" effects.

Two distinct kinds of spokiness may be observed. If curly film is wound with the concave side out, the spokes visible on the two sides of the film will always be opposite each other. If the roll is wound with the concave side in, the spokes will be alternate. The spokes seen on one side of the roll will never be opposite those on the other side of the roll.

Embossing.—Embossing was a common defect prior to the advent of the rear type shutter, which came into use at about the same time as did the sound movies. It has always been considered an important defect from the point of view of projection quality. It is obviously due to differential heating of portions of the image due to varying densities throughout the image. The blacker portions get hotter and are shrunken by the heat. Sometimes this effect is most pronounced at the frame lines, when it becomes known as frame-line embossing.

Although it may possibly be that under certain circumstances embossing

FIGURE 1. *Left, smooth roll; right, spoky roll.*



The five most generally recognized types of film distortion are discussed in the accompanying article. These consist of curl, spokiness, embossing, flute or long edges, and buckle or short edges.

Curl has come to be an accepted fact and is ordinarily without importance in projection except when it becomes excessive.

Spokiness, sometimes called square rolls or hexagonal rolls, is a phenomenon observed when film with a high degree of curl is wound with insufficient tension to keep the roll perfectly round. Poor screen quality in the case of 16mm films has sometimes been associated with this defect.

Embossing is due to differential shrinkage or hardening of the emulsion caused by local absorption of heat in the dense portion of the picture. Careful tests have failed to show any effect upon the screen such as in-and-out of focus due to image embossing. Measurements of the magnitudes of the distortions show that these are ordinarily much less than the depth of focus of the lens.

Flute, or long edges, is more often seen with safety film than with nitrate film. It is generally caused by a stretching of the edges by recessed rolls, by shrinking the center of the film with high-temperature arcs on projection, or by exposing the roll to excessively high humidities, which causes swelling at the edges. Laboratory tests as well as field experience indicate that fluted edges very rarely cause distortion of the images on the screen.

Buckle, or short edges, is believed to be the most serious type of film distortion. It is caused by greater loss of moisture or solvent from the edges of the film than from the center. This leaves a fullness of the center resulting in an "oil-can" effect when film passes through the projector, thus producing pictures that go in-and-out of focus on the screen.

Buckle trouble may result from storing rolls of film in packages that are easily permeable to moisture vapor but it may be avoided by the use of impermeable packaging materials.

† J. Soc. Mot. Pict. Eng., July, 1943.

may increase the tendency of film to show in-and-out of focus effects, we have never found a single case of embossing that by itself gave focusing difficulties. One fact was observed, however, that fresh film, and especially film not thoroughly dried, tended to emboss more than well seasoned and dried film. Since it is also a fact that insufficient drying and seasoning tends to produce in-and-out of focus troubles from other causes, we sometimes find that film that has been embossed has also shown in-and-out of focus troubles.

FIGURE 2.

Flute, or long edge in cine film.

Flute or Long Edges. — The fourth type of film distortion, flute or long edges, is now seen more often with safety film than with nitrate film. A typical example of flute or long edge film is shown in Figure 2. It is caused by shrinking the center of the film without shrinking the edges or, conversely, by stretching the edges.

(*a*) *Flute from shrinkage of the center of the film:* When film, especially safety film, is projected repeatedly at high heat intensities, the center tends to shrink more than the edges, causing a particular type of flute often known as "twist," since a strip of film stretched between two points gives the appearance of being twisted.

(*b*) *Flute from stretching the edges of the film by means of recessed rolls:* The edges of the film are often stretched in processing machines by pulling the film too tightly over recessed rolls while the film is wet or while it is hot.

(*c*) *Flute from stretching the edges of the film by the use of twisted strands:* Occasionally processing machines are designed in which the film is turned between each pair of rollers so that the emulsion side will never be in contact with the rollers. If the distance between the rollers is too short this twist puts an additional strain upon the edges of the film which often produces flutes.

(*d*) *Flute from stretching the edges of the film through swelling of the edges:* Flute is sometimes produced in raw film if a tightly wound roll is exposed to very high humidities. Moisture is absorbed by the edges of the film but does not travel far into the center. This means that the edges increase in thickness and each layer builds up on the one under it. Even though this thickening of a single layer of film may amount to only 0.00001 inch, there are, nevertheless, 650 layers in a 1.000-foot roll of film. The increased thickness of each layer builds up on those below it so that the edges of the roll will have a diameter 0.0065 inch greater than the center and this increased diameter can occur only by stretching the edges of the film.

Buckle or Short Edges.—The kind of distortion that has caused by far the greatest amount of trouble with 35mm film is short edges. At the Eastman Company the term "buckle" is reserved entirely for this type of distortion, although in the trade almost any type of distortion is frequently referred to as "buckle."

Figure 3 shows a typical example of buckle produced by short edges. It is ordinarily produced whenever a film containing a sufficient amount of water or residual solvent is wound tightly and permitted to dry so rapidly that the moisture can not diffuse from the center toward the edges as rapidly as it is taken away from the edges. The edges shrink as they dry and may become permanently distorted. The effect is worse with film having a high potential shrinkage than with modern low shrink film, but even this film can be buckled due to moisture losses if conditions are right.

(*Continued on page 20*)

FIGURE 3.

Buckle, or short edge in cine film film.

LIBRASCOPE, INC., AWARDED ARMY-NAVY "E"

Librascope, Inc., Burbank, Cal., is another manufacturing subsidiary of the General Precision Equipment Corporation (formerly the General Theatres Equipment Corporation), that has received the Army - Navy "E" award for excellence in production of war material for the Navy. The announcement was made by Earle G. Hines, president of the General organization.

Herbert Griffin

Librascope, Inc., is managed by Herbert Griffin as president, who also is vice president of the International Projector Corporation, and is well known in the motion picture field. The concern produces a computer of unique design for use by the ordnance and aeronautical departments of the armed forces. It is the second subsidiary of General Precision Equipment Corporation to be awarded the "E" flag, the other being the Cine Simplex Corporation, Syracuse, N. Y., which in peacetime was engaged in the production of cameras for use in motion picture studios and for newsreel work.

General Precision Equipment Corporation's six manufacturing plants at the present time are operating at capacity both in the manufacture of their regular motion picture equipment, most of which is for the government, and also in the manufacture of instruments of critical and urgently needed types.

IN THE SPOTLIGHT

By HARRY SHERMAN

WE understand that Allen G. Smith, chief of the WPB Amusements Section, has authorized the manufacture of one hundred projectors each quarter year to replace projection machines that have been ruined by fires in various theatres throughout the country.

Needless to say, it serves our best interests to have all motion picture theatres remain open for business, but we certainly are not in favor of awarding new projection equipment to those exhibitors who display an utter lack of concern for the maintenance and safeguarding of the equipment in their theatres. These exhibitors are negligent in the replacement of worn parts in their projection machines, and bitterly oppose the two-man shift—both precautionary measures that would, to a great extent, eliminate the ever-present fire hazard. Their chief interest is centered in the box-office, and as long as they can wriggle out of spending an extra dime for the maintenance of their theatre equipment, they will do so.

It is our opinion that before releasing new equipment to replace equipment damaged by fire, the WPB should demand from each exhibitor a guarantee that definite steps will be taken to protect and properly care for any new equipment granted to him. "This is War, Conserve," should be more than merely a slogan to these penny-pinching exhibitors.

● Joseph L. Kamrowski, member of Local No. 233, Buffalo, N. Y., has been in service for the past year and is now stationed at the New London, Conn., Naval Base. Kamrowski is one of the many I. A. members projecting pictures for Uncle Sam's fighting forces, and although he enjoys navy life, he is looking forward to a speedy victory by the Allies and his return to the projection room of the Lovejoy Theatre in Buffalo.

● We are very happy to announce that I. A. Local 306, New York City, and the Empire State Union (the largest of the rival projectionist organizations in this city) have successfully terminated their recent negotiations for a merger between the two unions. The entire membership of the Empire Union—234 men—individually applied for and were granted full membership in Local 306, and a certain number of 306 men joined Empire. The Empire Union officials resigned in a body, and all Local 306 officers, with one unimportant exception, now preside in the same capacity as officials of Empire.

For many years Local 306 and Empire had been negotiating on and off to effect a merger between the two organizations. These transactions would have come to a successful conclusion years ago had it not been for the constant interference of certain theatre interests who, for obvious reasons, encouraged the existence of rival projectionist unions (*see I. P. for June* 1943, *p.* 15). Upon being informed of the recent negotiations between the two unions, these exhibitors obtained a temporary injunction restraining Empire Union from dissolving its state charter, and the matter is now pending in the courts, where it may be some time before the case is legally settled. Meanwhile, the exhibitors who formerly patronized the Empire Union must from now on deal with Local 306 officials. Yes, sir, there is more than one way to skin a cat!

● We recently received a post card from our good friend, Thad Barrows, Local No. 182, Boston, Mass., which has us somewhat puzzled. The card in question was postmarked Sabago Lake, Maine, and on it Thad penned a note saying that he was up there searching for Veronica and all he could find was Sabago. Positively no prizes awarded for solving this riddle.

● An item that appeared in the newspapers recently interested us very much. It stated that a certain business man classed all labor unions as "no good" and expressed the opinion that "the sooner they (the unions) were outlawed, the better it would be for the nation." He further asserted that the business agent of a union was the "big boss," and retained for himself 50% of all monies collected for initiation fees, dues, etc. When questioned as to the source of his information he replied that he "religiously read Pegler's column" and from "other sources." This sounds very much like a shot of anti-labor propaganda usually fired by the National Association of Manufacturers. Organized labor's war record is the best answer to such vicious lies.

● According to published reports, the United States Army is stocking up on phosgene gas for spraying our enemies in case they should decide to use gas on our fighting men. In the June issue of I. P. we advised our readers against the use of fire extinguishers in case of a projection room fire as the "*carbon tetrachloride in the commercial form used in fire extinguishers is a liquid which produces fumes that are injurious to human health.*" These fumes are known as PHOSGENE GAS!

● Once more we crow "I told you so." In the August 1942 issue of I. P. this department warned local union business agents to be on the lookout for night clubs offering motion picture shows (run by non-union projectionists) instead of the usual "flesh" entertainment. We stated then that the practice of employing non-union projectionists to run these pictures would be wide-spread unless the union officials nipped the practice in the bud, so to speak. Many night clubs in the state of Pennsylvania have been operating along this line, and just recently we were informed that a well-known night club in Youngstown, Ohio, joined the parade.

● To be forewarned is to be forearmed—this holds true in peacetime as well as in wartime. When such prominent personages as James L. Fly, Chairman of the Federal Communications Commission, Rep. Eugene Cox of Georgia, and Eugene L. Garey, attorney for the Cox Committee, start wrangling in Washington for control of the television airwaves then we know *positively* that there are big things in the offing. Let's not be

caught short as we were when sound first came in, but let's prepare for the day when this country returns to a peacetime basis and industry returns to normalcy. Union officials should have their wage scale and manpower schedules all set and in working condition, while the members should prepare themselves for the day when television becomes an integral part of motion picture theatre entertainment. It won't be long, boys, so get busy.

● Hats off to the membership of Local No. 376, Syracuse, N. Y. They called the bluff of some of the so-called patriotic exhibitors in their city who made it a practice of running the Government shorts only at the last show, thereby eliminating overtime pay to the projectionists. The union served notice to all exhibitors in Syracuse that unless they complied with the policy of showing these Government shorts at *all* shows, the projectionists would no longer waive the overtime due them. There are many such "chiseling" exhibitors throughout the country and it is high time they were told where to get off.

● The German-controlled Paris radio quotes Rome as saying that despite the change in the Italian government, General Victor Ambrosio, a Mussolini hangover, has been retained as Chief of the Italian General Staff by the Badoglio regime. To the best of our knowledge, Gen. Ambrosio is not related to the Local 306 official who bears the same name.

● The short item that appeared in this department in the last issue regarding the call for projectionists to operate machines on the African front seems to have created quite a flurry with I. P. readers. To date we have received hundreds of letters, wires and telephone calls requesting further details regarding these jobs. It looks very much as though many of our fellow-craftsmen do not find working conditions in this country to their liking, or is it that the call of adventure is too strong in most of us to resist?

● E. L. Cline, member of Local No. 150, Los Angeles, Calif., is now serving with the Navy as a radio technician. While on furlough in New York, Cline paid a visit to the Paramount projection room and was very much interested in the presentation of the show. He would like Tommy Armentrout, of 150, to forward his I. A. service card to him in care of Camp Bradford, Norfolk, Va.

● The members of Local No. 249, Dallas, Texas, recently set up and ran a show for tubercular children at a nearby camp. As usual, the theatre managers received all credit and publicity in the local newspapers, with not a word of thanks to the union. In the name of humanity and unionism, we congratulate Local 249 membership for its splendid efforts to bring a bit of sunshine into the lives of these unfortunate children.

● First Lt. Merle Chamberlin of the Signal Corps, has been transferred from the Long Island Studio in Astoria, N. Y. to Fort Sam Houston, San Antonio, Texas. We missed Merle when he called at the I. P. offices to take us to lunch the day before he left for Texas, but are now serving notice on him that we have taken a rain check on that luncheon date.

● The following description of a scab, as defined by Jack London, the world-famous author, is, to our mind, a classic: "*After God had finished the rattlesnake, the toad and the vampire, He had some awful substance left with which He made a scab. A scab is a two-legged animal with a corkscrew soul, a water-logged brain and a combination backbone made of jelly and glue.*" Can anybody beat that?

● Chicago Stage Employees Local No. 2 were recently denied a 5% increase by the wage stabilization director for the Chicago area. This increase was denied despite the many salary cuts the local has granted the exhibitors over a period of years—temporary cuts, of course, just to help the exhibitors over a rough spot or two. This merely bears out our contention that a *so-called temporary* cut usually turns out to be a permanent reduction in salary. Gullible local union officials take heed!

● Exhibitor publications have been gloating over the phenomenal business reported in the first-run houses in and around the Times Square sector of New York. Just glance through these figures: For the July 4 weekend the estimated total attendance at Radio City Music Hall was 83,000, and Paramount Theatre played to about 60,000 patrons for the same period. The Capitol had to stop the sale of tickets on Sunday of that week-end for two hours due to the large number of people waiting in line, while the Roxy reported an attendance of 25,000 patrons on that same day, this figure being topped for the next day—July 4. The Strand, a smaller house, played to 14,780 people in one day, and the Astor Theatre, with a seating capacity of only 1,134, played on Monday to over 10,000 patrons.

Some of these Broadway houses open at 8 o'clock in the morning and close at 3 the following morning. Deposits are heavy and the managers are getting round-shouldered toting them to the bank. We may be getting round-shouldered also but not for the same reason.

● We were saddened to learn of the death of Ira G. Becksted, member of Local No. 160, Cleveland, Ohio. Becksted, who worked as projectionist at the Jennings Theatre in Cleveland for many years, was a member of many organizations, among them the Masons and the Knights of Pythias. He was one of the pioneer I. A. members and prior to his prolonged illness took an active part in union matters. Our condolences to his wife and son, who survive him.

● The hobbies and artistic inclinations of our fellow craftsmen are many and varied. M. E. Hoenig, member of Local No. 307, Philadelphia, Penna., recently completed a mosaic portrait of the late Mrs. Sara Delano Roosevelt, which he presented to her son, President Roosevelt.

● A few notes anent Altec personalities: Warren Conner, Cincinnati district manager, has checked in at the New York office; E. O. Wilschke, of Altec Lansing, Hollywood, is now in New York, and the Detroit district manager, F. C. Dickely, is also in New York for home office conferences.

Check presented in the name of N. Y. Central Trades and Labor Councils to AFL for the purchase of two flying fortresses. The presentation of check was made at a recent testimonial dinner by Tom Murtha, president of the N. Y. C. Trades and Labor Councils, and business agent of Local No. 4, Brooklyn, N. Y.

Cleveland Projectionists Work Full Shift in War Plant

UNDER THE leadership and suggestion of Joseph Buzek, member of Local No. 160, Cleveland, Ohio, seven other members of the local joined him in holding down full-time jobs in a war plant in addition to their regular projectionist duties. Each evening when these men are through with their theatre work they report to the Iron Fireman Mfg. Co., where they aid in turning out tank, aircraft and bomb parts.

In addition to Buzek, who is a projectionist at the Norval Theatre, the following Local 160 projectionist members are also employed at the war plant: Edward Crowley, of the Olympia Theatre; Kenneth Prater, of the Sun Theatre; Floyd Weber, of the Homestead Theatre; Robert Bullock, of the Parma Theatre; Norman Rose, of the Market Square Theatre; Reynard Osborne, of the Beachcliffe Theatre, and Jack Diebold, of the New "Y" Theatre.

Buzek has been a motion picture projectionist for over thirty-one years, having started his career at the age of 17. In those early days the machines were cranked by hand, and he has been an eye-witness to the vast improvements made during the last few decades. Buzek is also a member of Troop D. Auxiliary Mounted Police, an organization made up exclusively of Local 160 members.

When the idea was born to double up in war work, Joe Buzek got in touch with all his friends by telephone and mail and in a very short time he had seven recruits. The Iron Fireman Mfg. Co. has worked out a special schedule for these men who leave their theatres at 11:30 p.m. and report at the war plant at 12:30 and work until 7:30 the next morning.

More Anent the Smith-Connally Anti-Strike Law

IN last month's issue of I. P. we expressed our opinion of the Smith-Connally Anti-Strike Bill and its effect upon organized labor. That our opinion is shared by many of the leading newspapers in the country is further emphasized by an editorial which appeared in the August 2, 1943-edition of the New York Times headed "How To Provoke Strikes," in which this law is called a "hasty, ill-considered and confused measure."

The Times editorial further states: "We agreed with the President that the provisions for strike ballots and for cooling-off periods were clearly out of place in a measure which in another part sought in effect to outlaw wartime strikes altogether. But the potential mischief of a badly drawn law is now to be multiplied incalculably by a worse interpretation.

"The law provides that '*the representative of the employes*' of a war contractor shall notify the Secretary of Labor, the National War Labor Board and the National Labor Relations Board of any '*labor dispute*' involving such contractor and his employes, and that thirty days thereafter, unless the dispute has been settled, the NLRB shall take a strike ballot.

"The Attorney General was asked, as he puts it, whether the term '*the representative of the employes of a war contractor*' means the '*representative of a majority of employes in an appropriate bargaining unit . . . or whether it means the representative of any group of employes.*' He has decided that '*the term in question is to be interpreted as referring to the representative of any group of employes.*'

"This is precisely the interpretation calculated to work the most harm. Under it, if as few as two or three men in a plant employing thousands of men wish to force a strike ballot, they can do so by the simple expedient of giving notice that a '*labor dispute*' exists. . . .

"The country should not be surprised if the Attorney General's ruling is now followed by a flood of strike ballots. The harmful potentialities of indiscriminate strike ballots in wartime is so serious that Congress should amend the Smith-Connally Act at the earliest possible moment."—H. S.

[Italics by I. P.—Ed.]

Upper left, Buzek at his projection machine in Norval Theatre; center left, Buzek at war plant. Lower, left to right: Reynard Osborne, Edward Crowder, Norman Rose, Robert Bullock, Kenneth Prater and Floyd Weber.

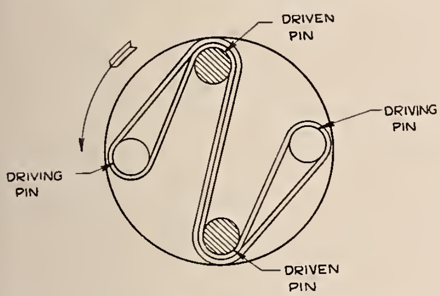
AT YOUR SERVICE

This department is a collection of random thoughts and some not so random; fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Emergency Substitute for KS-5259 Motor Generator Coupling

Having experienced considerable breakage of the coupling disc used on the motor generator KS-5259 W. E., I have had much success with the following substitute:

A loop of leather strap 12 inches long (one inch allowed for lap), ½ inch wide and approximately ⅛ inch thick, is made



into a continuous loop by riveting the two ends together, thus forming a loop 5½ inches long when pulled tight from two opposite ends. The strap is then installed according to the sketch above. —Omer S. Wible, *RCA*.

Projector Port Hole Sound Trap

Glass is commonly used in port holes where it is desired to isolate the noise from the projection room. It is essential, however, that a good grade of optical glass be used over the projector port, and that the surfaces be kept immaculate at all times. You can eliminate the glass in the projector port and still have a noise-proof port by installing Celotex baffles the exact size of the porthole. Space these baffles one inch apart, with a hole cut in the center of each baffle just large enough for the projector light beam to pass. Light then passes through the port unobstructed, while sound is trapped in the pockets formed by the spaces between Celotex baffles. This is commonly known as the gun silencer principle.—H. E. Frisbie, *RCA*.

Protecting the Commutator

When brushes tend to cause annular rings around a commutator, these grooves also wear ridges in the brushes, and a sort of vicious interaction takes place which, once started, gradually becomes worse. If, on the other hand; these brushes are removed for inspection and then returned to their original positions, the continuance of this wear is certain.

I have found that by turning, transposing, and otherwise juggling the brushes around so that their ridges will not fit the grooves already formed on the commutator, that these grooves will not only be prevented from becoming worse, but may actually be ironed out. When a brush is replaced in such a way that its ridges do not fit the grooves, we have high spots against high spots, and the resulting wear is a levelling process in which we are rectifying current with the copper and carbon being removed. This process should not be used to remedy badly grooved commutators, although many of them have been reasonably smoothed out.

It is not advisable to switch more than one or two brushes at a time, so as not to greatly reduce the current carrying capacity. This is contrary to the common practice of numbering and indicating orientation of brushes, a practice which I think has questionable merit. Where single brushes will not turn and fit the same grooves in any of the holders, replace with new ones, and just remove the ridges from the other brushes. —A. F. Schneider, *RCA*.

Protecting W. E. 12-Type Rectifier

The diagram below shows a method of utilizing an automobile headlight relay and starting button. There still are plenty of these parts in auto supply stores and the cost is within a few dollars.

The relay is energized from a tap on the five ohm series resistor that will give between five and six volts. One end of the relay coil is usually grounded to the relay frame, but the relay is mounted on the bakelite terminal board which handles the power supplies. The button is mounted by forming a large square hole from four of the small square holes on the upper left side of the amplifier housing. The bleeder resistor remains connected to the rectifier output when the relay is closed. I have found that this provides more stable operation than if the bleeder circuit were broken.—E. T. Brown, *RCA*.

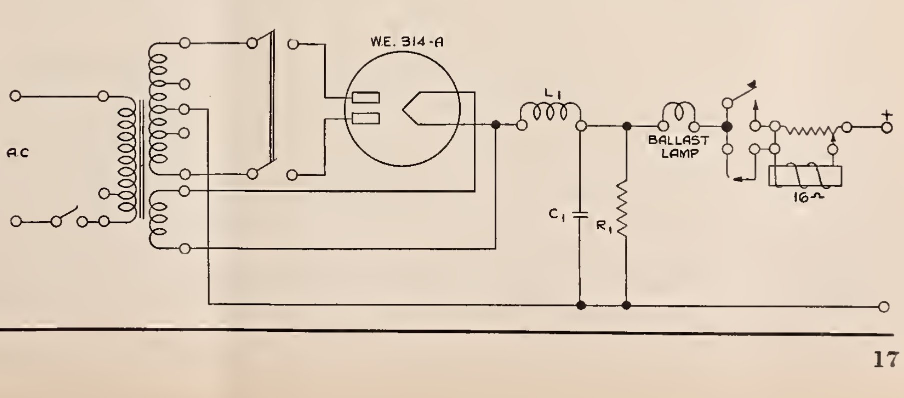
Clearing a Stubborn Case of Hum Trouble in 41-Type Amplifier

An extremely low rumble was finally traced to the input transformer of the 41-type amplifier. The same proved to be an inductive pickup hum from various sources. Long shielded leads were put on the transformer and tests were made in various locations and angles. By placing the transformer considerably above its normal position and at a very sensitive angle, the trouble was overcome. I finally placed the transformer about 2½ feet above its normal position and at a null plane angle.—Emil de Neuf, *RCA*.

Conservation of Resistor and Resistor Contact Sliders

There is an exciter lamp supply in the PG-59 systems which is made up of two Rectox units. In the primary circuit of these units is a resistor with a slip ring for adjusting the voltage applied to the lamps. In the course of time the small contact point on this ring becomes worn and carbonized, making a very

(*Continued on page* 19)



PREVIEW THEATRE SYSTEM

(*Continued from page* 11)

In regard to the operation of such a system, if it is desired to operate as a standard sound system, switch S-1 should be set in "Out" position which disconnects the Link Circuit Amplifier and the associated volume controls. If either microphone or phonographs input is desired, however, set switch S-1 in "In" position and switch S-2 for the proper input. Switch S-3 may then be set in "Booth" position if the volume is to be controlled from the booth, or in "Aud" position for auditorium control of volume. In the latter case the projection room has no control of the system volume.

Preview Operation

When the system is to be operated for preview purposes, switch S-1 is set in "In" position, switch S-2 as desired, and switch S-3 as conditions dictate. Let us suppose that the system volume control is to be retained in the booth. P-1 should be set on step 15 initially, switch S-3 in "Booth" position, and the volume control in the pre-amplifier adjusted for adequate volume level in the auditorium. Once so set the pre-amplifier volume control setting should not be changed. All volume changes are made on P-1, which has become the main system volume control. Likewise no changes should be made in any other gain controls that may be present in the system. Thus any volume changes from then on can be recorded as a setting of P-1, or translated into db differences with direct relation to the spot in the picture where the volume change was made.

Auditorium Control of Volume

Suppose now that the observer in the auditorium is to take over control of the volume. Immediately before the transfer is to be made the booth advises him of the setting of P-1. He sets his volume control on the same point and then switch S-3 is rotated to "Aud" position. All control of system volume has now passed from the booth to the observer in the auditorium and under no circumstances should any changes in volume controls, gain controls or attenuators be made in the booth. When control of volume is to be transferred back to the booth the observer advises the projectionist of the setting of his control. The projectionist sets P-1 on the same point and rotates switch S-3 to "Booth" position. Thus the cycle is completed.

Rehearsals Pay Dividends

As far as we know the number of systems of the preview type in the country is small, but they perform an important function in contributing to the running of the best show. A rehearsal, or preview, is necessary to obtain a smooth running show and one that will please the patrons. We do not hear many complaints from patrons, but they do go to the theatre giving the most pleasing show.

In too many theatres too little attention is paid to the level at which the picture is run. There is no regular trained observer in the auditorium to listen and correct conditions. Except for the conscientious effort of the projectionist to give the best performance, we find little progress in systematic assistance on the part of the personnel whose duties keep them in the auditorium.

The projectionist cannot be sure by listening to his monitor speaker as to what is happening in the auditorium, and his duties in the projection room do not permit him to find out for himself. On the other hand if he were furnished with cued settings on his volume control as the result of a rehearsal, he would have a systematic method of producing the results that every projectionist wants. A good rehearsal pays dividends and is well worth any expense involved. Let us promote rehearsals.

AT YOUR SERVICE

(*Continued from page* 17)

poor contact. This condition causes a varying voltage to be applied across the exciter lamps, and this varying voltage is suggested as a reason for lamp failure in this particular type of equipment. This may be remedied by flattening the original contact and making another one on the opposite side of the ring.—CHAS. MOORE, *RCA*.

Protection Against Shock or Injury

I have found it a good policy to type a sticker with the words *"High Voltage, Turn Amplifier Off and Discharge Condensers With an Insulated Screwdriver,"* and paste it as close as possible to the capacitor fusing of an ERPI 46, or similar capacitor fused amplifiers. A badly shocked projectionist would be a very poor booster for our service.—WM. H. REASON, *RCA*.

Conservation of Tubes

In checking on the short life of 2545 and 43 type tubes in some of the W. E. Monitor Amplifiers, I found that in some cases those amplifiers containing a 1 to 1 ratio 110-volt transformer (PA-7388) were running the tubes at 3 to 5 volts above their rated 25 volts across the heaters. A further check showed that the transformer was boosting the a.c. line voltage several volts. In order to reduce the voltage to normal, I installed the resistor in series with the heater circuit.—B. D. DOUGLAS, *RCA*.

Reducing Drain on 80-Type Rectifier

When speaker fields are not supplied from MI-9350 or MI-4256 amplifiers, the current drain on the 80-type rectifier may be reduced as follows:

Connect the 80 filament to the red-green wire (secondary tap not normally used) instead of to the No. 1 post on the under chassis terminal board. Reverse the bleeder by connecting R46 to the 80 plates instead of to ground. Connect R49 to ground instead of the 80 tube plates. Make minor bias adjustments by shorting out bleeder sections. The bleeder may be re-located inside the chassis to make adjustments easier. No new parts are needed and the drain is reduced to about 50 mils. — FRANK ADAMS, *RCA*.

Take-up Belt and Friction Disc Adjustment

Take-up belt and friction disc adjustments on a motion picture projector are very important items and require frequent checking. There should be sufficient belt tension so that when the projector is running and the take-up shaft in the lower magazine is held by the hand, the belt pulley will revolve smoothly and evenly without any slippage.

In splicing belts, be sure to use proper size hooks. Do not use a pointed instrument to pierce the belt; you can do a much better job by using a small drill after flattening the belt in a vise, thus making it easier to place the hole in the center of the belting. After the splice is made, the belting can again be rounded by a little pressure on the sides. It is a good idea, when getting a new belt, to stretch it *before* using by suspending one end from a suitable hook and attaching a weight to the other end, otherwise the belt will have to be shortened after a short period of service.—HARRY M. MORROW, *RCA*.

Conservation Hints

Much has been said about the conservation of energy and material in order to aid the war effort. In the use of Victory carbons and reduced power supplies it is essential that we take every care to see that arc lamps work at their best possible efficiency.

To check the wiring from the current source (generator or rectifier) obtain a piece of heavy insulated wire about two feet long and on each end place a large battery clip, making sure that the connections are very tight. Now attach one clip to one side of a splice, or bolted lug joint, and the other clip to the other side, or from one side of the arc switch

(*Continued on page* 22)

FILM DISTORTIONS

(*Continued from page* 13)

The use of ordinary cardboard boxes caused by the shortage of tin for shipping film from laboratories to exchanges offers ideal conditions for the formation of buckle. The freshly processed film, often in equilibrium with 50-60 per cent relative humidity, often may be exposed to humidities as low as 10-15 per cent due to the high moisture permeability of the cardboard.

Experiments have shown that conditions such as described above will almost invariably buckle moist film, whereas film that has been thoroughly dried in processing will not buckle as readily. If the film, before being placed in plain cardboard containers, is wrapped in an envelope of a highly moisture-resistant paper, this tendency to buckle is practically eliminated. New types of cardboard boxes in which a highly moisture-resistant layer is incorporated in the box itself probably will protect the film even better than these moisture-proof envelopes.

The reason why short edges are so much more likely to produce in-and-out of focus effects upon the screen than any other kind of film distortion is that these short edges always leave a fullness in the center of the film that produces an "oil-can" effect. The center of the film is free to bend in one direction or the other. It is this uncertainty as to the direction in which it will bend that leads to the in-and-out of focus effect upon the screen.

Film showing in-and-out of focus due to this particular effect can sometimes be corrected by changing the moisture content of the film so as to give it a potential tendency to curl in either one direction or the other. As long as it always curls in the same direction while it is in the gate, no in-and-out of focus will be observed. Such film can further be corrected by stretching the edges. This can be done by passing the film over an internally heated flat roller which shrinks the center and stretches the edges slightly.

It is our hope that this discussion will not only help to clarify the nomenclature of different types of film distortions, but that by helping us to understand the causes of these distortions, will result in better projection and better entertainment.

McNABB SEES LARGE POSTWAR USE FOR OPTI-ONICS

"Out of the greatly accelerated technical and research developments of this war period is coming a new science," said J. H. McNabb, president of the Bell & Howell Company, in a recent interview in Chicago.

"This science of Opti-onics is not optics; it isn't electronics; but it is a combination of both, combined with precision mechanical design," stated Mr. McNabb. "Actually, in the physical world, we reach a point where ultra-high frequency radio waves take on many of the characteristics of light rays. We have learned that optical science can bring much to the development of electronics. Likewise, electronics enhances and supplements the work of optical science.

"A good example of the necessity for combining certain portions of these two sciences into one is furnished in television. The electronics engineer can devise a system electronically which transmits and receives a visual image on the fluorescent surface of a cathode ray tube. But here the optical engineer must take over and devise an optical system which will enlarge and reproduce this image to a usable size and form. The work in the two fields must be coordinated. This coordination and combined work on the part of our research staff of engineers, to be truly descriptive, must be called Opti-onics."

Mr. McNabb predicted unique but highly practical devices for entertainment and service for the postwar world to arise from the field of Opti-onics. "Today, Opti-onics is a weapon," continued Mr. McNabb, "but tomorrow it will be a servant which will work, protect, educate, and entertain."

Letters to the Editor

To the Editor of I. P.

I have just finished reading the article, "A Complete Study on the Prevention of Film Damage," by Henry B. Sellwood, which appeared in your July 1943 issue. I think such articles are of great benefit to the craft and hope that you will publish more of them. I am afraid, however, that they are apt to be passed up by those projectionists who would profit most by them.

It seems to me that Mr. Sellwood has left out one very important reason for film damage, and that is careless rewinding of reels, by both projectionists and exchanges. If you will examine a carelessly rewound reel you will find layers of film projecting, which, when handled or shipped, will crack or chip.

Also, in his article he states "You also may find that your fire shutter has dropped." I am unable to understand how a fire shutter dropping can damage film, and look forward to an explanation in a subsequent issue of I. P.

Howard B. Smith
Springfield, Mass.

(ED.'S NOTE: Mr. Smith has made a good point in stating that careless rewinding of film causes film damage. Misalignment between successive layers may result from eccentric shafts upon which the reel is being rewound and the takeup reel. In addition to using only straight reels, the rewinder should be carefully inspected to make certain that the shafts are concentric with respect to each other and are in alignment. Film layers should be smooth and not even a single layer should project.

Regarding Smith's comment on the dropping of the fire shutter: This would be the result of too large a loop above the picture gate and not the cause of film damage. In the upper part of many mechanisms there is a trip which will drop the fire shutter when the loop is too large. It is possible for the film to slap against this trip and prevent it from operating. This slapping may also scratch the film or damage the edges. If, however, this trip is properly adjusted and free in action, the film damage will be minimized, as the trip will operate quickly when the loop is too large.

We appreciate the comments of this reader and we welcome similar letters. It is in this way that we all progress and the editor admits that regardless of the care taken in the preparation of an article, he is by no means infallible.)

To the Editor of I. P.

I enjoy your magazine immensely, particularly the articles by Leroy Chadbourne.

I am a projectionist in a small theatre that was equipped with Simplex Sound AM-142 previous to my employment here, and I believe this circuit was described in Mr. Chadbourne's articles for April 1943, (Figure 2), and May 1943, (Figure 1). I should like to know whether or not I am correct in assuming that the schematics mentioned in the aforementioned two issues are of the Simplex Sound Circuit AM-142.

D. M. Decker
Deckerville, Mich.

(ED.'S NOTE: Mr. Decker is correct in his assumption.)

MARSHALL GETS HONORABLE MENTION FOR DEVICE

Ashton Marshall, who has been with the International Projector Corporation since 1929, has been awarded honorable mention by the Labor-Management Committee of the Metropolitan District. He suggested a grinder attachment device which keeps the table at uniform speed for a dressing operation. Previously, the operator had to estimate when the table was traveling at the same speed as the previous dressing. If the speed is faster, more grit is removed; if slower, less grit is removed. This results in losing the correct number of oscillations required for exact size, as well as in the loss of time. Mr. Marshall's device eliminates guesswork and saves approximately three minutes in every operation.

FRAME SUCCEEDS GILMORE AT WESTERN ELECTRIC

After forty-one years of service Harry B. Gilmore, secretary of the Western Electric Company, will retire on September 1, it is announced by the company's directors. He will be succeeded by Norman R. Frame, formerly assistant secretary, who was elected to his new post on July 13.

Mr. Frame has been with the organization for twenty years. After he was graduated from Columbia University and the Albany Law School he practiced law for several years, joining the Western Electric Company in 1923. He served as attorney with the company and with its wholly owned subsidiary, Electrical Research Products, Inc. During 1926 he was attorney and secretary of the Graybar Electric Company, and on April 13, 1943, he was elected assistant secretary of Western Electric.

WESTINGHOUSE RELEASES MOVIE AND ELECTRONIC BOOKLET

An educational motion picture released by Westinghouse, "Electronics at Work," explains the six basic functions of electronic tubes and shows how each type of tube is used in some of the latest industrial and military applications.

Animated drawings are utilized, which show tube construction and explain how the cathode, anode and grid elements rectify, amplify, generate, control, transform light into electric current and transform electric current into light. The film is loaned free for showing at war plants and engineering and technical societies, and is available in 16 mm. print.

The company also has published a 44-page booklet describing electronic applications in industry, in the war, in medicine and the home. This illustrated work shows the various types of electronic tubes, key units of every electronic device, for such applications as industrial control, diathermy, power conversion, X-ray and radio. A copy of the booklet may be secured from Department 7-N-20, Westinghouse Electric and Manufacturing Company, E. Pittsburgh, Pa.

AT YOUR SERVICE

(*Continued from page 19*)

to the other side where the blade makes contact along the same wire.

In this manner follow along each lead, taking in every splice or connection from the current source to the carbon holder. At the same time observe the ammeter on the lamp. If, on any of these tests, it is found that by-passing any connections with your test lead causes the ammeter to increase, that connection needs attention and should be cleaned and thoroughly tightened.

If the rectifier or generator is located in another room at some distance from the arc, the wiring should be checked for size to determine whether or not it is of the proper carrying capacity as recommended by the manufacturer. Wiring from source to arc should be as short as conveniently possible and any unnecessary lengths should be removed to shorten the distance the current must travel. In many projection rooms both rectifiers are permitted to run for the duration of the show. It would mean a lot in the conservation of both current and rectifier tubes if the rectifier was cut off on the off-machine after each changeover. To do this, remove the switch from the d.c. circuit and feed the d.c. circuit directly to the lamp. Change the switch to the a.c. input circuit of the rectifier.—C. R. SHEPARD, *RCA*.

Checking Alignment of Arc Lamps

With three point pedestals, arc lamps are readily thrown out of proper position by bumping or vibration of machines. Lamps may be easily checked by removing lens tube and placing a flashlight in the lens holder. Sighting over the carbons from the rear of the lamp will readily show if lamps are in direct line with aperture and lens. A poor light at the edge of the screen which cannot be cleared by adjustment of mirror or carbons indicates that the lamp is not properly aligned.—R. S. SEAR, *RCA*.

• BUY WAR BONDS •

Motiograph Inaugurates Plan for Pooling of Equipment

FRED MATHEWS, president of Motiograph, recently issued a statement in which he discussed current equipment difficulties, and announced that Motiograph dealers are cooperating in a nation-wide plan for the pooling of scarce equipment.

"Motiograph dealers, in company with a nation-wide group of others," said Mr. Mathews, "have formed a 'Used Equipment Mart', the purpose of which is to locate and purchase such surplus equipment as theatre owners have. This equipment is remodeled or rehabilitated and then redistributed to theatres where it is needed. There is a member of this Used Equipment Mart in every film center in the country, and in a few of the more important cities as well."

Mr. Mathews further stated that the August issue of *Sound Track*, which is published by his company for free distribution to theatres throughout the country, will provide a blank for the listing of surplus equipment and the items required by the various theatres. Among the saleable items suggested for listing are included unused generators, rectifiers, arc lamps, projector mechanisms, motors, surplus spare parts of all kinds, fonts of marquee letters, and so forth. Each item should be described as accurately as possible as to age, condition, make and model, serial number, etc.

"So that the plan may be national in scope," continued Mr. Mathews, "it is necessary that there be a central clearing house. For purposes of convenience, this headquarters has been set up at Motiograph, to whose offices the completed supply lists are to be mailed. Immediately upon receipt of individual lists they will be sent to dealers serving the various theatres. At the same time individual wants or lists of surplus equipment (with theatre name deleted), will be included in lists which will be sent at frequent intervals to every other dealer who is a member of the mart. Thus, if one dealer is unable to supply an individual theatre's requirements, it is more than likely that he will be able to obtain needed equipment from another dealer. The plan already is in operation and has proved valuable to many theatre owners."

News in the Supply Field

A NEW REEL-END ALARM

A new reel-end alarm manufactured by the Ace Mfg. Co. of New York has just made its appearance on the market. This device is entirely mechanical and can easily be installed by following the very complete directions furnished with each pair of units. The only tools required are a ¼″ drill, screw driver, cutting pliers and a small wrench. Fifteen minutes are all that is needed to install each unit on a projection machine.

The drill is required to bore a hole in the back of the upper magazine close to the front. A bushing through this hole serves to clamp a plate on which a gong is mounted, and also serves as a hearing for the shaft on which the gong clapper and a lever inside the magazine are fastened. A roller on the end of the lever rides on the film; the lever moves downward as the reel unwinds until it loses contact with the film and drops all the way down. The clapper then gives a signal which is audible above the noise of the projection room.

This clapper is mounted on a coiled spring shaft, its position heing adjusted so that it is ¼″ away from the gong when the lever is in downward position. Therefore, when the lever drops, the spring shaft whips so that the clapper travels that extra ¼″ to give the gong a smart tap. A chain, adjustable in length, is attached to the shaft and magazine door and serves to raise the lever out of the way when the magazine door is opened for threading. The only maintenance necessary would be the occasional application of a very little light oil to the lever roller and shaft bearing, and checking the bushing for tightness. Due to the simple principles incorporated in this device, there seems to be no reason why it should not last indefinitely.

The manufacturers of this product offer a one-year unconditional guarantee to all purchasers.

RADIANT OFFERS SCREENS MADE OF NON-CRITICAL MATERIALS

The Radiant Manufacturing Company, of Chicago, announces a new full line of projection screens designed to fill all civilian supply, educational and visual training needs, which are made out of non-critical materials. Portable, table, wall and ceiling screens in a variety of sizes, all with the

Radiant "Hy-Flect" glass beaded screen surface, will be available for immediate delivery. Many features of former Radiant lines have been incorporated in the new line, and all models are available without priorities.

One model, a wall type screen, is housed in a sturdy, dust proof wood case into which the projection screen rolls up. All wood parts are finished smooth in black lacquer. Most of the company's production now is going to the armed forces.

DeVRY ISSUES "MOVIE NEWS" AND 16mm CATALOG

The motion picture industry has always found "DeVry Movie News" to be of value and interest, and the current issue, just off the press, is as excellent as the past ones. Its twelve pages are packed with interesting pictures, comments and data pertinent to audio-visual education. Those interested in the role of motion pictures in the drive to victory, and in the part movies will play in the postwar era will want a copy, which may be secured without charge by addressing DeVry Corp., 1111 Armitage Ave., Chicago 14, Ill.

The company also has available for free distribution its new 56-page catalog of 16mm education and recreational film. Sound and silent titles include a wide range of subjects to suit practically any taste.

Novel Crossword Puzzle Contest

CROSSWORD PUZZLE fans who have been working out the diagrams appearing in I. P. will find the one on page 26 somewhat out of the ordinary, as it is built on puns and anagrams, designed to make for a little variety. And this month's puzzle, as its predecessors, offers both entertainment and an opportunity to build up your reserve of War Stamps.

We will give a tip as to how the answers may be worked out. In the first definition "A unit is—," contains all of the letters for the answer. Simply unscramble them and you will get the answer, which is "Tunisia." That is the general idea, and quick minds should find lots of fun in filling in the diagram.

I. P. is offering War Stamps to successful contestants, with five prizes awarded each month to those who send in the correct answers *together with a letter not to exceed one hundred words on the question in the box below.*

Literary skill is not required to win a prize. The awards will be based on the practical manner in which the question is answered. Winners will be chosen by the editors of I. P., and their decisions will be final. In the case of ties, duplicate awards will be made.

When you have completed the Crossword Puzzle this month, write your letter answering the question, and mail both to the Contest Editor, International Projectionist, 19 West 44th Street, New York 18, N. Y., postmarked not later than Sept. 10, 1943.

August Contest Question

"Explain the Action of a Photoelectric Cell."

THE AWARDS

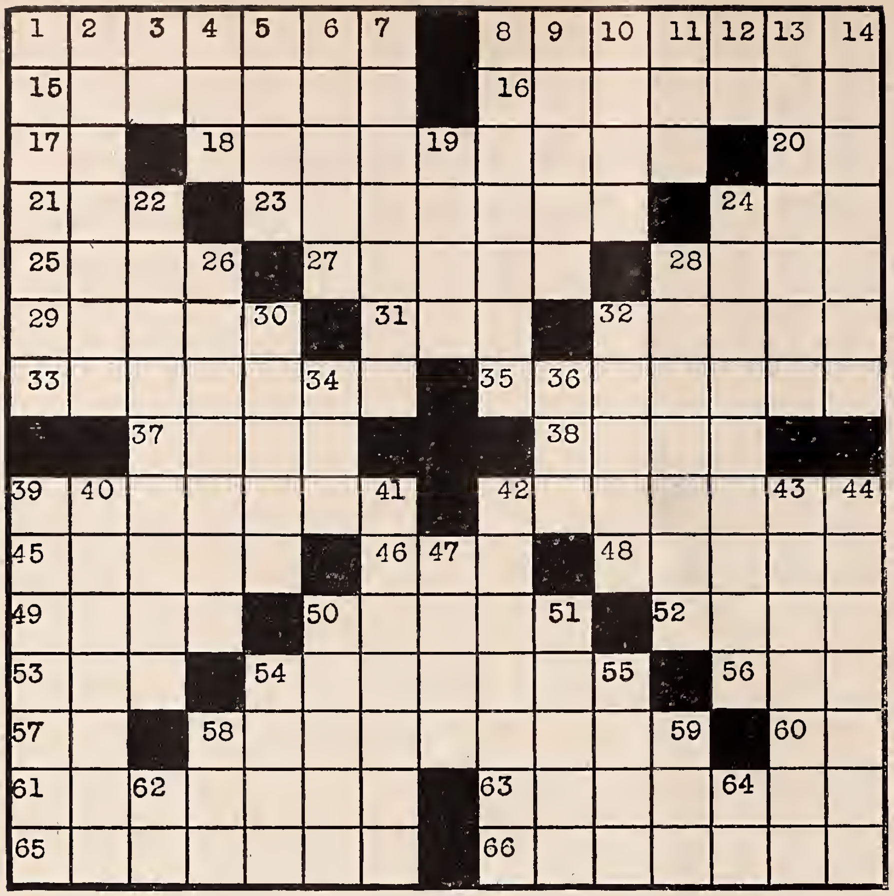
First Prize—$10 in War Savings Stamps.

Second Prize — $5 in War Savings Stamps.

Third Prizes—Three awards of $2 each in War Savings Stamps.

Solution to last month's puzzle

■	S	A	S	S	Y	■	L	A	M	B	E	R	T	■
S	E	C	T	O	R	■	A	P	E	R	T	U	R	E
A	N	I	O	N	■	P	R	E	S	S	U	R	E	S
C	O	L	A	■	T	A	I	R	S	■	M	A	P	S
A	N	I	■	S	A	I	N	T	E	■	■	L	A	E
T	I	A	R	E	L	L	A	■	D	I	D	■	N	D
R	A	T	E	A	B	L	E	S	■	B	E	T	■	■
A	N	E	U	R	E	A	■	U	N	A	L	I	K	E
■	■	D	E	E	■	N	A	B	O	N	I	D	U	S
D	D	■	L	D	S	■	G	L	O	A	T	E	R	S
R	O	T	■	■	P	A	L	I	N	G	■	L	O	A
A	N	A	S	■	A	L	I	M	S	■	N	O	S	Y
M	O	N	A	C	T	I	N	E	■	B	O	C	H	E
A	R	O	U	M	E	N	T	■	A	B	U	K	I	R
■	S	O	L	I	D	E	S	■	B	A	S	S	O	■



ACROSS

1. A unit in Rommel's last stand
8. He acted swindled
15. Do enter is more caustic than polite
16. Our dean gambles on the billiard table
17. A letter in Greek
18. A dual is an old slice of Spain
20. He's small, but important, when things are moving, abbr.
21. My soul and body
23. This is undignified and begins and ends low in France
24. "In shape no bigger than an agate stone" (Romeo and Juliet)
25. Backward praise is twofold
27. Axe in maize turns it blue
28. "A poor fish" is one
29. This is a nymph who pushed a boat along
31. Partly surprised
32. If they aren't strikes they are often these
33. You can get order out of chaos with esty
35. A fright makes a small Hollywood attraction
37. He's a cockney, to give you wherefore in the middle of Miss Muffet's diet
38. Her slip shows here
39. One mash is good for the feet
42. Tone-ded
45. A slam is worth two priests in Tibet
46. This is your field of beer
48. Hot votes
49. Very Young for General Electric
50. I open this thoughtfully
52. Writes backward
53. A woman must always be this
54. Mother's millinery attracts this Indian Sage
56. On the house
57. Orator's hesitation
58. Laura is at MacArthur's feet
60. A heifer by Hera until Egypt
61. The last treads softly
63. Hitler's forte
65. Here sat Queen Maria
66. Foes are hidden but its easy to see mine

DOWN

1. Part of Turkey is a dot seen in the Aegean
2. In S. A. this is both gay and gray, but has a lot of use
3. Upside down on top
4. She turned out to be a big help
5. What we should do with bombs for Japs
6. Did Madam X eat at this table of contents?
7. Mohammedan titles of respect for best Aga
8. In Scotland take candlesticks for boat trips
9. Salvation in a shoe
10. Change this brood for a patient wife
11. She'd be a father with another D
12. This comes before you do in the scale
13. You may be a late guest but you can put this down
14. Very senseless but end well
19. In a way mixed thin
22. The kind of blades these girls have make them moan worse
24. Do I not smell a heavy burden?
26. This is fatal
28. Short railroad inside twisted can-eaters means tourniquets
30. He was christened with mingled rewards for The King's Henchmen
32. They keep wheat chaff in these
34. Mashed potato goes with a clam
36. A place for golf in a bad French summer
39. Toss Lew around so he'l be last
40. Throw in an exclamation with merit for a 19th century English botanist
41. More than a fortune in this petroleum
42. If you eat tend to having teeth
43. Introduced as nee with a veil
44. Yes, plod along to get a wider front
47. Don't trust him with this Italian money change
50. They dry tobacco in these broken porticos
51. He went to jail in England (1692) for being a Unitarian
54. Goes in the Army, or won't
55. A French department ends up in anger
58. A constellation could be a river in Switzerland
59. Old Dutch measure worth 42 gallons of gas here
62. An electrical engineer with ease
64. Enter in reverse

S. M. P. E. MEETS IN HOLLYWOOD OCT. 18-22

The next meeting of the Society of Motion Picture Engineers will be held at the Hollywood-Roosevelt Hotel October 18-22.

Dr. C. R. Daily, of the Paramount Studios in Hollywood, has been appointed chairman of the papers committee.

LAST YEAR'S BONDS GOT US STARTED

THIS YEAR'S BONDS

ARE TO WIN!

★ Last year saw nearly 30,000,000 workers voluntarily buying War Bonds through some 175,000 Pay-Roll Savings Plans. And buying these War Bonds at an average rate of practically 10% of their gross pay!

This year we've got to top *all* these figures—and top them handsomely! For the swiftly accelerated purchase of War Bonds is one of the greatest services we can render to our country . . . and to our own sons . . . and our neighbors' sons. Through the mounting purchase of War Bonds we forge a more potent weapon of victory, and build stronger bulwarks for the preservation of the American way of life.

"But there's a Pay-Roll Savings Plan already running in my plant."

Sure, there is—but how long is it since *you've* done anything about it? These plans won't run without winding, any more than your watch! Check up on it today. If it doesn't show substantially more than 10% of your plant's pay-roll going into War Bonds, it needs winding!

And you're the man to wind it! Organize a vigorous drive. In just 6 days, a large airplane manufacturer increased his plant's showing from 35% of employees and 2½% of pay-roll, to 98% of employees and 12% of pay-roll. A large West Coast shipyard keeps participation jacked up to 14% of pay-roll! You can do as well, or better.

By so doing, you help your nation, you help your workers, and you also help yourself. In plant after plant, the successful working out of a Pay-Roll Savings Plan has given labor and management a common interest and a common goal. Company spirit soars. Minor misunderstandings and disputes head downward, and production swings up.

War Bonds will help us win the war, and help close the inflationary gap. And they won't stop working when victory comes! On the contrary—they will furnish a reservoir of purchasing power to help American business re-establish itself in the markets of peace. *Remember, the bond charts of today are the sales curves of tomorrow!*

You've done your bit Now do your best!

THIS SPACE IS A CONTRIBUTION TO AMERICA'S ALL-OUT WAR EFFORT BY

INTERNATIONAL PROJECTIONIST

INTERNATIONAL PROJECTIONIST

SEPTEMBER 1943

VOLUME 18 • NUMBER 9

25c A COPY • $2 A YEAR

RECOMMENDED TRIM AND RANGE OF ARC CURRENT FOR LAMPS USING COPPER COATED, HIGH INTENSITY, PROJECTOR CARBONS

Type of Arc	*Arc Current — Amperes*	*New Victory Carbons — Size and Type*
"1 Kw" High Intensity, A.C.	52-66	7 mm x 9 inch H.I., A.C. Carbons in both holders
"1 Kw" High Intensity, D.C.	40-42	7 mm x 12 inch or 14 inch "Suprex" Positive 6 mm x 9 inch "Orotip" C Negative
Simplified High Intensity, D.C. with *adjustable* feed ratio	42-45	7 mm x 12 inch or 14 inch "Suprex" Positive 6 mm x 9 inch "Orotip" C Negative
Simplified High Intensity, D.C. with *fixed* feed ratio	42-45	7 mm x 12 inch or 14 inch "Suprex" Positive 7 mm x 9 inch "Orotip" C Negative
Simplified High Intensity, D.C.	56-65	8 mm x 12 inch or 14 inch "Suprex" Positive 7 mm x 9 inch "Orotip" C Negative

You can obtain maximum efficiency and economy from your Victory Carbons by observing the following simple rules.

USE CARBON TRIM RECOMMENDED FOR YOUR PROJECTION EQUIPMENT.
The Victory Carbon trims indicated in the above table were established by comprehensive laboratory and field tests to ascertain the best results obtainable in all types of equipment.

OPERATE CARBONS AT SPECIFIED ARC CURRENT.
Better projection and greater economy are obtained when recommended arc currents are maintained. The maximum allowable arc current is stamped on each Victory Carbon at the left of the trade-mark.

CHECK FEED RATIO CAREFULLY.
Changes of arc current alter the ratio of burning rate between positive and negative carbons. On lamps equipped with adjustable feed and formerly operated above 45 amperes arc current, this ratio should be adjusted to meet the new current conditions.

A bulletin describing operation of the new Victory High Intensity Carbons is available for distribution and will be sent promptly upon request.

SAVE THE COPPER

Most of the copper used for plating copper coated projector carbons drops to the floor of the lamp house when the carbons are burned. Continue to save these copper drippings and turn them over to your supply dealer as designated by our government.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

NATIONAL CARBON COMPANY, INC.
Unit of Union Carbide and Carbon Corporation
UCC

Carbon Sales Division, Cleveland, Ohio
GENERAL OFFICES
30 East 42nd Street, New York, N. Y.
BRANCH SALES OFFICES
New York, Pittsburgh, Chicago, St. Louis, San Francisco

With time-saving, life-saving movies.... *outgrowth of* Kodak's *pioneer Teaching Films.....* the Army and Navy are giving millions the "know how" of war

HISTORICAL NOTE—Back in 1923, having perfected "safety" film—making classroom projection practical—Kodak made available 16-mm. movie cameras and projectors . . . and shortly afterwards pioneered a program of teaching films for schools.

Put yourself in the boots of one of these young men. You've been accepted for the Army or Navy. What do you know about this war of 2,000-horsepower aircraft motors . . . Bazookas . . . submarine detectors?

Our Army and Navy Commands realize this lack of experience. They know that you may go up against battle-wise troops or ship crews or flyers.

They have done the worrying for you. They will turn you out a better man—more competent in the use of your weapons, abler to take care of yourself—than any "trainee" who ever went before you.

Training Films are a great and growing part of their system. The Army and Navy have made thousands.

Don't get the idea that you're just "going to the movies," though. These movies are different. Each teaches you to do a part of your job in the Service—*do it exactly right.*

Maybe it's how to dig a foxhole. Or inflate a rubber life raft. Or take down and reassemble a 50-calibre machine gun. Or—bake a batch of bread . . .

In an Army and Navy made up largely of "specialists," thousands of films are not too many. (Kodak is a major supplier of film for these pictures—one big reason civilians are not getting all the film they want.)

You'll see battle, in these training movies. You'll hear it—to make your new life and work "second nature" under all conditions. *You'll be hardened . . . ready to "dish it out and take it" . . . up to 40% sooner because of Training Films.*

* * *

After this war is won, you—and millions like you who have learned so much, so easily, through training films—will want your children to learn the Arts of Peace this way.

Teaching through motion pictures and slide film—steadily growing in importance during the twenty years since Kodak made its first teaching films available—will really come into its own . . . Eastman Kodak Co., Rochester, N. Y.

Serving human progress through Photography

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

C. F. Alexander, *Technical Editor*
W. L. Lightfoot, *Associate Editor*

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Monthly Chat

MANY projectionists are asking the question: What is being done in television? What is its present status? When are all of us going to be able to enjoy television programs? The answers will be forthcoming in a series of articles soon to be published by I. P., written by James Frank, Jr., who has promised he will furnish all the answers, right to the minute. He is a qualified authority, so there is a real treat ahead.

• • •

Another treat of which we can avail ourselves is to participate 100 per cent in the $15,000,000,000 Third War Loan, which actually is an "invasion" loan. We learn that it will take about two billion dollars to bomb Berlin thoroughly, so there is little need for any selling talk to get you to "back the attack."

• • •

Good reading is news that the Goodyear Rubber Company has developed a real static eliminator, an electronic device that can be attached to any radio. Tests have shown amazing results to ears long-resigned to static interference. The device will eliminate static on the same frequency as an incoming signal, and it will automatically control the amount of static which can pass through a radio.

• • •

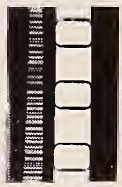
Another amazing development is a rubber that will conduct electricity, developed by the American Steel and Wire Company, which has produced a large-size electrical cable using this type of rubber, permitting transmission of higher voltages for operation of X-ray machines and heavy industrial equipment. The conventional high-voltage cable has, along its entire length, some slight discharge of electrical energy, which ionizes small amounts of air, and which may consist of electrical arcs and sparks, all highly injurious to rubber. Carrying off this discharge by means of a shield has been resorted to, but if the cable is bent or if it contracts or expands with changes in temperature, gaps are formed in the shield at intervals throughout its length which destroy its effectiveness. The new semi-conducting rubber can be placed between metallic shields and the insulation so as to carry off and dissipate such discharges before any damage can be done to the insulation.

• • •

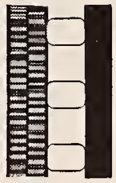
The veil of secrecy surrounding radar has been lifted and we find that the principle was recognized in this country as early as 1930. The scientists responsible for the marvelous development in radar are looking to its application in the post-war period. They vision many applications and, with developments continuing, it is not unreasonable to expect, when peace comes, the field of radar will have expanded beyond the most optimistic dreams now held.

Before Pearl Harbor

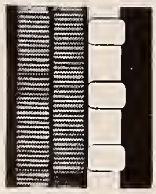
1928
SINGLE DENSITY



1932
SINGLE DENSITY
SQUEEZE

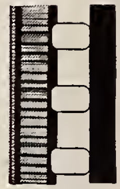


1934
PUSH-PULL
DENSITY
100 MIL

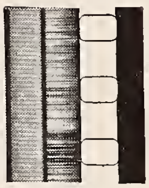


1937
PUSH-PULL
DENSITY
200 MIL

1938
PUSH-PULL
AREA
200 MIL



1940
SINGLE DENSITY
WITH 5 MIL
CONTROL TRACK



1941
COMPREX DENSITY
WITH 100 MIL
CONTROL TRACK

1941
COMPREX BILATERAL
AREA WITH 100 MIL
CONTROL TRACK

1941
STEREOPHONIC
AREA
3 SOUND TRACKS
1 CONTROL TRACK

1941
STEREOPHONIC
DENSITY
3 SOUND TRACKS
1 CONTROL TRACK

POST-WAR
194X
?

Above you see ten different sound tracks made with Western Electric Equipment from 1928 up to the beginning of the war.

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Wonderful new weapons—based on the engineering principles learned in recording sound for motion pictures—are being developed and perfected today. They will help to end this war sooner. Where and how they are serving will make an interesting story when it can be told. In the course of this wartime development program, the scientists at Bell Telephone Laboratories and Western Electric are constantly adding to their already unique knowledge of sound-recording and transmission.

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INTERNATIONAL PROJECTIONIST

VOLUME XVIII SEPTEMBER 1943 NUMBER 9

Standby Features for Sound Systems

By *LEROY CHADBOURNE*

INTERNATIONAL PROJECTIONIST repeatedly has stressed the importance of incorporating emergency features in sound systems and also has emphasized the necessity of providing various types of devices that will keep the show going in case of failure. This is due to the difficulty in obtaining quick replacement of parts. Under normal conditions, however, emergency features are just as important as they are at the present time.

In case of electrical or mechanical failure, if a duplicate unit is available, it can quickly be cut into service. There will be no waiting, on the part of the audience, until the unit can be repaired by the projectionist or until a service man can complete his work. Certain of the equipment manufacturers have recognized this necessity and have included some standby equipment in their standard systems.

A few of the large theatre chains, such as Paramount and Loew's, Inc., have as a result of their experiences, become convinced that the quality of the performances given in their theatres will suffer unless adequate standby equipment is installed. They have insisted that the sound systems provided for their theatres have more emergency features than included in standard systems. In this way they are confident that in case of failure the only delay will be the time required to throw switches or start another projector.

Figure 1 is a block schematic of a system installed in Loew's American Theatre in New York City. At first glance many emergency features appear, but there are others that do not show in this figure. First of all there are three projectors. Any two of the three can be used together and in case of failure of the operating projector, the film can be quickly transferred to the third machine and the show continued. We also see that an exciter lamp power unit (*Figure 2*) is provided for each machine. This unit normally supplies 4 amperes at 9 volts d.c., but in case the rectifier unit fails a.c. can be fed to the exciter lamp by the operation of one switch located on the power unit panel. If the unit fails completely there still are two machines left.

Hidden Emergency Features

The pre-amplifiers, one cabinet for each machine, are of the type shown in the diagram on page 9 of the April, 1943, issue of I. P., except that a coupling capacitor is added in the output circuit to remove plate voltage from the changeover switch. Here is where the first of the hidden emergency features appears. Each cabinet contains two of the amplifiers, so connected that either one may be used by the operation of one switch on each amplifier. The chances of both amplifiers failing at the same time are remote, but if this should happen there still are two machines left. Plate and filament supply are obtained from the power amplifiers. Separate filament supply leads are carried to each machine from the source so that trouble in the leads to one machine do not affect the other machines. The plate supply is fed to the amplifier-filter shown schematically in *Figure 3*.

At the right of this figure we see three two-stage resistor-capacitor filters, each with a loaded output. The failure of one of these filters, barring a short circuit, will not affect the other two. While the supply is obtained from the power amplifiers, here again we have provision for emergency operation. In case of failure of one of either pair of amplifiers, an amplifier selector switch mounted in one of amplifier cabinets may be thrown to disconnect the inoperative pair and the system continues to run on one-half normal power. This switch not only switches sound circuits, but plate and heater supply at the same time. It also provides for the interchanging of the heater and plate supply to the monitor amplifier located in the network.

The chances of more than one amplifier failing at the same time are remote, so that half normal power can be considered as always available. If, by chance, one in each pair should fail a few simple reconnections will disconnect the inoperative amplifiers, connect the remaining two amplifiers in parallel and we still have half the normal power available. The type of amplifier used is shown in schematic form on page 21 in the May, 1938, issue of I. P.

Monitor Amplifier

The monitor amplifier is located on a separate chassis which plugs into a socket in the network chassis. Thus, in case of failure the replacement is simple. During the time required to obtain a new amplifier, the monitor speaker is not inoperative, as the operation of a switch on this amplifier chassis removes the amplifier from the circuit and the monitor speaker is connected directly across the output of the power amplifier. The volume will, of course, be somewhat lower depending upon the setting of the main system volume control, but it still will be audible. Since this amplifier is of the push-pull type using only one tube and having two transformers, a capacitor and a vacuum tube, the vacuum tube can be considered the only normal replaceable item, and so replacement of the entire unit is remote.

The network used is of the two-way series type, having the proper output impedances to operate two high frequency and four low frequency speakers. It includes two switches, which permit the testing of each stage unit in the projection room. Furthermore, the circuit is so arranged that during the testing constant circuit impedance is maintained. This means that in case of failure of one of the high frequency units, it may be switched out of the circuit and the show continued on one HF unit. Quality will suffer slightly, but sound will be intelligible.

If both high frequency units should fail, the operation of a switch on the panel of the network disconnects the HF units and transfers the low frequency units directly across the output of the power amplifiers. Thus the show still goes on, even though the highs will be missing. Low frequency units fail less frequently than HF, but in case such a condition did occur provision is made to continue the show on the remaining units.

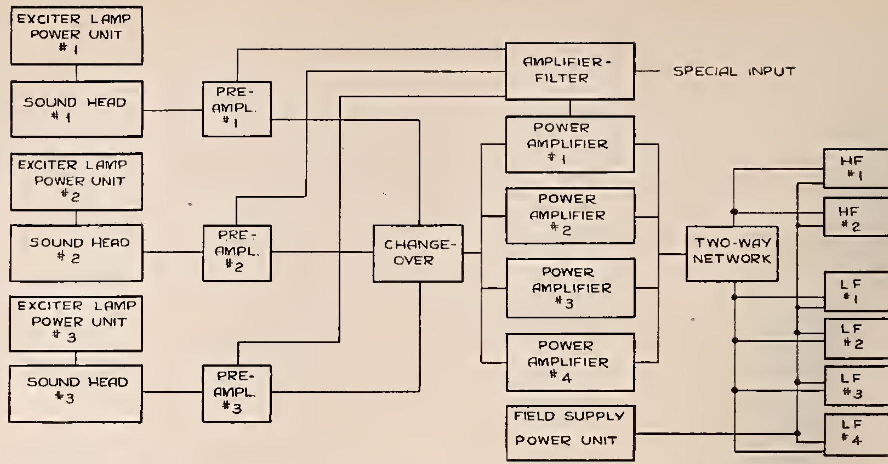


FIGURE 1. *Block schematic of sound system in Loew's American Theatre, New York City*

There still is one more possibility and that is failure of one of the components of the network. This is rather remote, but if it did happen the same switch that disconnects the HF speakers removes the network from the circuit at the same time. Therefore, again, the show could continue on the LF speakers only.

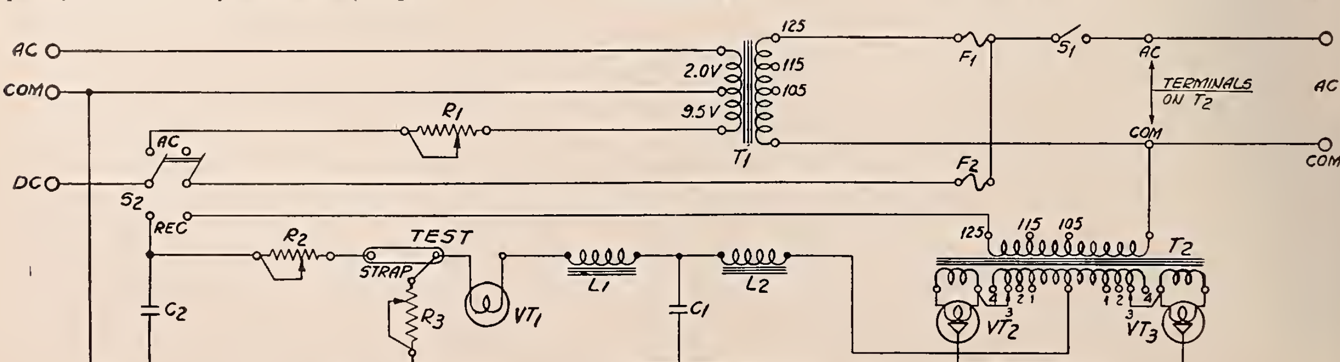
The stage speakers used are of the energized type, having a 110-volt field. A conventional rectifier using 5Z3 tubes in parallel is employed. If this unit fails a switch is provided which connects the arc generator output to the fields. This feature illustrates the result of coordination in the design of the various components comprising the booth equipment. In so many instances speaker fields are for voltages above or below this voltage. But when they are of the same voltage as a power supply like the arc generator a standby feature is simple to provide.

The amplifier shown in *Figure 3* is actually an extra feature rather than standby equipment. Instead of providing for connecting auxiliary inputs to the pre-amplifiers a separate unit is included. It might be said, however, that this unit can be used for interlude music in case one of the pre-amplifiers should fail, instead of having silence while the third projector is being threaded. This would not be possible if the auxilliary inputs were connected to a pre-amplifier that failed.

This amplifier is of the conventional resistance-coupled type. Terminal *H* at the left of the figure is connected to the grid of *V*-2 while terminal *L* is connected through *R*-24 to the grid of *V*-3. Low level inputs therefore would be connected to terminal *H* since this circuit has the higher gain. By the same token high level inputs are connected to terminal *L*. This amplifier, therefore, can be used with either high or low level inputs, the volume of either being controlled by the potentiometer *P*-1. *P*-1 has a control of 38 db in 19 2-db steps.

In case a low level, low impedance input is to be connected to this amplifier, it is first connected to terminal *L* and ground, the dotted strap between the junction *C*-1 and *R*-2 and ground is added and the value of *R*-1 changed to the impedance of the input. The circuit from the junction of *R*-1 and *VT*-1 grid

FIGURE 2



to the junction of C-3 and P-1, which contains R-24 is broken. As shipped, both terminals H and L are for the connection of high impedance inputs. We thus have a very flexible amplifier for phonograph and microphone or PA attachments. Inputs are controlled by a convenient three-position switch which selects any one of three inputs.

The changeover switch is of the rotary type which selects any one of the three machine outputs. The cabinet, containing the switch, is located at the operating position of the middle projector and extension rods extend from either side of the cabinet to the operating positions of the other two machines. Thus changeover may be made at any machine regardless of the machine in operation. An indexed dial is provided on the shaft at each position. The indexing is so arranged that changeover to either of the other machines may be made without going through any intermediate position. That is, clockwise rotation from a given position gives one machine, while counter-clockwise rotation connects the other machine. This switch is rapid and noiseless in operation. Since it is entirely mechanical and accessible, maintenance is extremely simple.

Form of Insurance

The system described may be considered as of the de-luxe type and not adaptable to a large number of theatres in the country because of the initial cost. However, standby features fall into the same class as any form of insurance. After all, insurance in its many forms is carried to compensate for potential losses. Standby features, therefore, are for the purpose of insuring continuity of shows and consequently the maintainance of box office receipts, if we look at it from the exhibitor's angle only.

The projectionist needs standby features so that he will be confident that he can run the show without breaks and be proud of his efforts. Without standby features a failure means a lot of scurrying around to determine the cause, (all causes are not too evident), and then working against time to get the picture back on the screen as soon as possible. Meanwhile the audience is restive, a few perpetually disgruntled patrons soon arise, go to the box office and demand their money back, and so the trek begins. Soon the theatre is empty and the projectionist, who has done his best, is left "holding the bag." Exhibitors can't seem to understand why the equipment should fail only while the show is running, and at that time are particularly hard to live with.

Standby equipment is the answer to the public's demand for a continuous show without breaks and it seems as though they are entitled to it. The few extra dollars involved in adding the emergency features during the initial installation should be considered as the purchase of insurance and will pay dividends in the same way that automobile and fire insurance do.

The projectionist who formulates a plan with regard to the features required in his particular theatre can be of great assistance to the management when the time comes to purchase new equipment. Also since many of the manufacturers of sound equipment offer additional features which may be added at any time, he can plan for the step-by-step additions in a logical, systematic way.

He should first determine what equipment should be added to give proper protection and then in what sequence it should be added. Here his experience with his own system determines the sequence. What unit has given the most trouble? That is the unit that should be duplicated first. Other units would follow in the order in which they have caused grief.

No Set Procedure

There can be no set procedure for acquiring this equipment as the different types of systems in use are quite likely to show different weaknesses. It may be said, however, that electrical equipment may be more prone to cause trouble than mechanical. In mechanical equipment we have visible moving parts, and careful inspection will detect potential trouble. The ear also will note a difference in the sound of the unit.

Electrical equipment does not show visible movement. Flow of current and electrons does occur, however, and stresses and strains in the components are set up. Careful inspection and tests do not in many instances detect potential failure and so there eventually is a breakdown for no apparent reason. It is all very mysterious to the casual observer. Why should failure occur? For the same reason that failures occur in mechanical equipment. The parts wear out, since no part can be expected to last forever. In a few instances it may be due to faulty manufacture. No matter how careful a manufacturer may be, a few parts that are below his standards may slip through occasionally. These are the ones that cause a lot of grumbling in the field.

And so we end our plea for more emergency equipment in standard sound systems and trust that the systems introduced after the war will provide proper and adequate features.

A. E. MEYER HEADS PROJECTION DIVISION OF N-S-B

A. E. Meyer has been appointed manager of the Projection Equipment Division of the recently organized National-Simplex-Bludworth, Inc., and will leave shortly for a trip to the Pacific Coast, stopping at important centers to meet theatre owners and National branch managers.

Mr. Meyer, who for many years was sales manager of the International Projector Corporation, also expects to see leading projectionists and attend meetings of I. A. locals to discuss subjects which will lead to improved maintenance and secure better projection under existing conditions. This is regarded as a matter of great importance to the entire motion picture industry and is part of the National Conservation Campaign and patriotic effort.

Details of the trip will be announced at a later date and Mr. Meyer will be glad to receive any suggestions which will enable him to make his trip as successful as possible and render a service to the industry at a time when the fullest cooperation is so urgently needed.

TWO NEW AGREEMENTS REACHED FOR ALTEC SERVICE

The Publix-Bamford circuit of Asheville, N. C., has signed Altec Service for a sound and repair-replacement agreement for the company's houses. A similar contract has been entered with the Joy Theatres, Inc., New Orleans, covering twenty theatres in Louisiana, Mississippi and Arkansas.

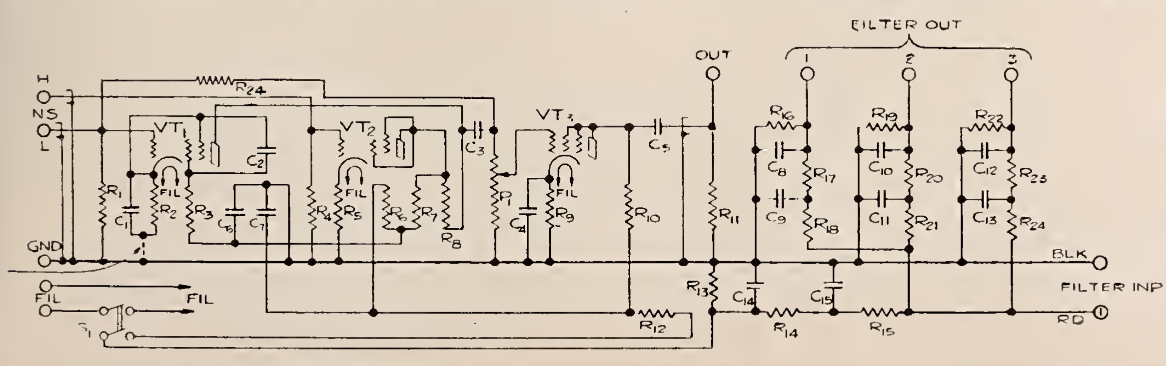


FIGURE 3

In the study of the effects of high-temperature acrs on 35-mm motion picture projection, it was noticed that the sharpness of the image on the screen was materially affected by changes in the heat intensity. This indicated that film does not always lie in a flat plane in a projector gate, but takes different positions at different temperatures.

In order to study this phenomenon more carefully, a portion of the projector gate was cut away permitting high-speed Ciné Kodak pictures (about 1500 frames/second) to be taken of the film as it passed by the aperture of a projector. The pictures show that most films enter the gate in a state of slight positive curl (curl toward the emulsion) and then change to a state of negative curl during the instant they remain exposed to the heat of the arc. This change in curl is due to the expansion of the emulsion layer by the heat. This effect is especially pronounced with the new high-intensity arcs.

The effect on the quality of the screen image of this change in curl of the film in the gate was studied by means of high-speed Ciné Kodak analysis of the screen image. The pictures show that at high heat intensities and with the projector focused to give the sharpest image on the screen, the images are in sharp focus for only a portion of their duration on the screen. Each screen image comes into view out of focus and gradually becomes sharper until just before the pull-down when it reaches its maximum sharpness. Such pictures are of good screen quality if the projector is focused carefully.

Under certain conditions, when the film is in a very moist state and when lamps of the highest heat intensity are used, the screen images may not be at all sharp. Occasionally a few frames may be entirely out of focus. The high-speed analysis of the action of the film in the gates shows that these out-of-focus frames behave in an abnormal manner. In these frames the normal change in curl from positive to negative in the gate is interrupted by a reversal back to positive curl.

Thus at the end of the pull-down cycle these frames lie in a plane slightly toward the lens of the projector, whereas all of the normal frames lie in a plane slightly toward the lamp from the plane of the gate. The distance between these two planes is greater than the depth of focus of the lens and these abnormal frames appear out of focus. It is believed that this sudden reversal to positive curl is due to a contraction of the gelatin due to loss of moisture.

It is recommended that the heat intensity at the aperture, as measured by a thermocouple should not exceed 1250° F. and that films should be dried thoroughly.

Effect of High-Intensity Arcs Upon 35-mm Film Projection†

By *E. K. CARVER*, *R. H. TALBOT*, and *H. A. LOOMIS*

EASTMAN KODAK COMPANY

RECENT improvements in arc lamps and carbons which have made possible brighter pictures on the screen have brought forward again the problem of the effect of extreme heat on motion picture film.

Whereas in the past a thermocouple[1] held in the gate of a projector seldom reached a temperature of 1000° *F*, some of the arcs and lamps now in use may heat the thermocouple to as high as 1700°*F*. These excessively high temperatures are not without effect upon the physical state of the film subjected to them and consequently on the resulting picture quality!

The purpose of this article is to illustrate the physical changes that take place in the film during the brief time it remains stationary in the gate of the projector and is subjected to these high temperatures, as well as the effect that these phenomena have upon the appearance of the screen images.

Changes in the heat intensity at the aperture were measured by inserting a thermocouple at the center of the aperture in the exact plane normally occupied by the film. An iron-constantan thermocouple terminating in a stainless steel disk 6-mm in diameter was employed. The temperature which this thermocouple will attain is arbitrarily called "heat intensity." This manner of estimating heat intensities is admittedly empirical, and is influenced by the size and color of the disk, radiation therefrom, etc., but furnishes quite reproducible results.

It was noticed immediately that the sharpness of the picture upon the screen was influenced materially by the heat intensity. A picture whose image was in sharp focus with a heat intensity of 1000°*F* could be thrown decidedly out of focus if the heat intensity were raised or lowered a few hundred degrees. This indicated that film does not always lie in the same plane in the gate but takes different positions at different temperatures. In order to demonstrate this more clearly and at the same time obtain a measure of these displacements, it was necessary to calibrate the projector lens system so that axial displacement of the center of the film in the aperture could be followed by noting the distance the lens must be moved from its normal position to keep the image in sharp focus upon the screen.

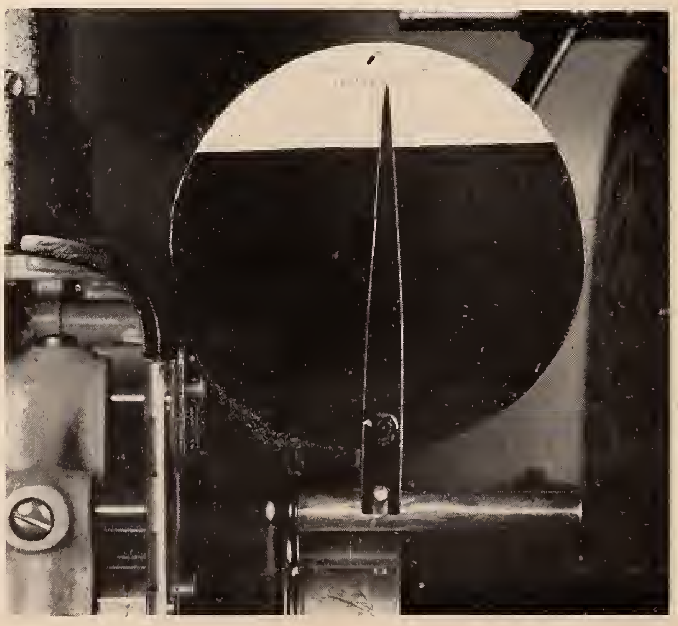


FIGURE 1. *Focus indicator on E-7 projector*

† J. Soc. Mot. Pict. Eng., July, 1943.

The lens system was calibrated by attaching an indicator to the system as shown in Figure 1. The lower part of the indicator hand is attached directly to the lens barrel, then to a fixed fulcrum which magnifies the lens displacement at the tip of the pointer so that lens movements of 0.01 inch are read plainly and movements of the order of 0.0025 inch can be estimated.

Film Movement in Aperture

The focus indicator was calibrated in the following manner: A strip of film was held in a perfectly flat position in the gate by means of a piece of steel 35-mm in width. A small hole drilled in the center of this metal strip allowed a portion of the test image to be projected upon the screen. Since the film was not in motion a faint source of light was used at a considerable distance from the film in order to eliminate any heat effect. Thus the lens setting for best visual focus for perfectly flat film in the gate was established. This we shall call "zero focus."

In a like manner, the lens setting for film that has been displaced a known amount was obtained by mounting the film on metal shims of known thickness and placing the shims against the film trap. Thus if a shim 0.01 inch in thickness were used, the film would be moved axially toward the lens 0.01 inch. The best visual focus was again obtained by projection of the image and the focus indicator calibrated.

FIGURE 2. ***E-7 gate cut away for aperture pictures***

As is well known, film that curls so that the emulsion side is concave is referred to as having "positive curl," and film that curls in the oppositive direction is referred to as having "negative curl." Since the film in the gate has its emulsion side toward the arc, and has its edges pressed against the gate, it will be seen that if film has positive curl, the image plane at the center of the film will be shifted toward the projector lens.

The shift of the lens in order to correct for this displacement will be referred to as a *positive* focus. In like manner, if the film in the gate of the projector has a negative curl, the image plane at the center of the film will be displaced in the opposite direction or toward the lamp. The shift of the lens to correct for this displacement will be referred to as a *negative* focus. Thus it may be seen that the effective position of the film in the gate, so far as the screen image is concerned, may be arrived at during projection simply by setting the lens at the best visible focus and reading the displacement of the lens in hundredths of an inch on the dial.

It was discovered immediately that almost without exception new films projected at the customary heat intensity of about 850°*F* or higher assumed a negative curl in the aperture. This was viewed at first as a rather disconcerting discovery inasmuch as such films are almost always in a state of slight positive curl.

In fact, film entering and leaving the gate was observed to have slight positive curl, and yet the focus indicator showed plainly that the film in the aperture, while the image was being projected upon the screen, was negative in curl to the extent of, in many cases, at least 0.01 inch.

On the other hand, it is quite logical to assume that temperatures of this magnitude, even though operating but for an instant, could effect this change in the physical state of the film. One has, in effect, a situation analogous to a bimetallic strip such as is used in many thermostats. This consists of two bonded metal strips, one having a greater coefficient of expansion than the other. When heated, the strip is forced to assume a curvature convex to the more rapidly expanding element.

In our case, the emulsion layer and the support form the two members of the strip. The expansion takes place almost wholly in the emulsion layer since the support absorbs practically none of the heat. Expansion of the emulsion layer would force the strip of film to be convex to the emulsion or negative in curl.

In order to determine at what point in the pull-down cycle the reversal of curl took place, high-speed motion pictures were taken of the film as it passed through the aperture. In most of this work, a Simplex *E-7* projector with a McAuley *Hy-Candescent* Lamp and New Super H. I. National carbons were used. However, certain phases of the work were repeated with other projectors and other lamps and the same results were obtained.

It was necessary to cut away a portion of the *E-7* gate, as shown in Figure 2, in order to obtain the pictures of the film as it passed by the aperture. A reference bar was attached to the gate so that slight movements of the film in relation to this bar could be observed (Figure 3).

Figure 4 shows this special gate in place on the projector, and Figure 5 shows the high-speed Cine Kodak in position to take the pictures. The pictures were taken at an angle of about 15 degrees from the plane of the film.

By this means pictures have been taken of film in the aperture of projectors at a rate of about 1500 frames per second. In other words, with film traveling through the 35-mm projector at the normal rate of 24 frames per second and with the film remaining stationary in the aperture for 1/32 second, about sixty 16-mm exposures were made between successive pull-downs.

As is known, there are two blades on the shutter of a standard 35-mm projec-

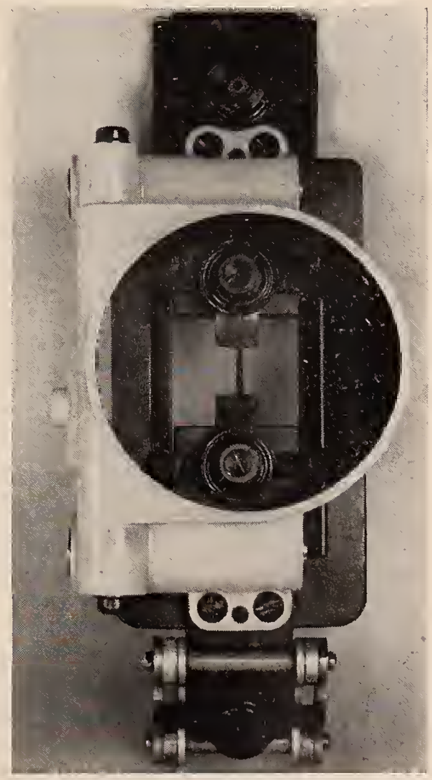


FIGURE 3. ***E-7 gate with reference bar attached***

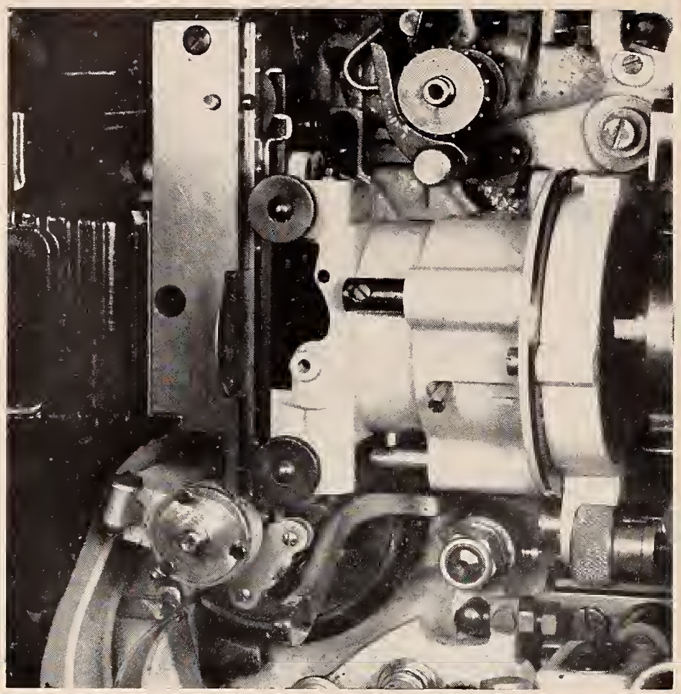


FIGURE 4. *Cut-away E-7 gate on projector*

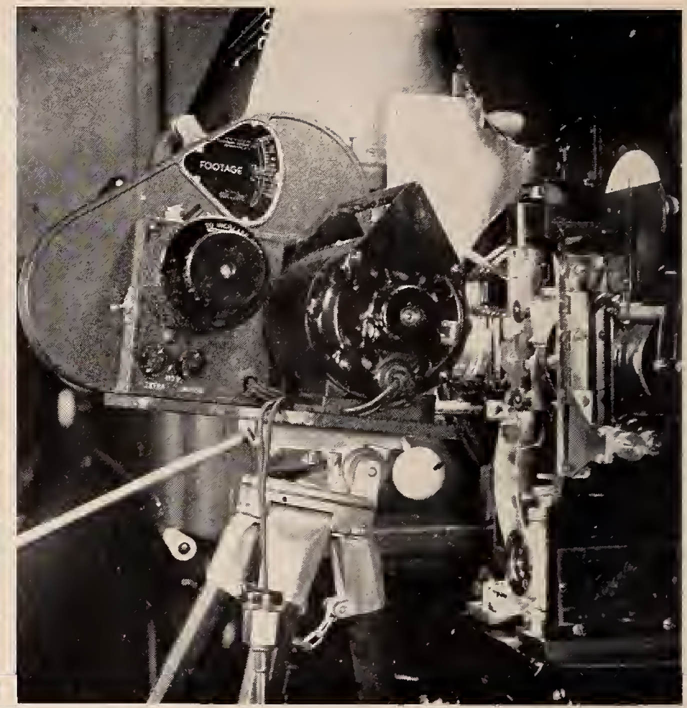


FIGURE 5. *High-speed Ciné Kodak focused on aperture*

tor. One blade is to mask the movement of the film as it comes into place in the aperture, and the purpose of the other blade is to interrupt the light once during projection so as to keep the periods of dark and light on the screen of more equal duration and thus minimize flicker. Therefore, the 16-mm high-speed pictures have a dark portion of about 12 frames between consecutive pull-downs of the 35-mm film, representing the blocking-out of the light by the flicker blade. A typical sequence of pictures obtained from the end of one pull-down to the beginning of the next is shown in Figure 6.

When the 16-mm pictures were projected the movement of the 35-mm film in the aperture of the projector could be clearly seen. The pictures show that the film comes into the aperture in its normal state *i.e.*, flat or slightly positive in curl; then as the heat strikes the film the emulsion layer expands, forcing the film into a state of negative curl. The expansion of the film starts immediately after the pull-down and reaches its maximum just before the next pull-down. The passing of the flicker blade halts this expansion effect momentarily.

Figure 7 is an illustration of four 16-mm frames taken of one complete 35-mm pull-down cycle. *No. 1* frame was taken immediately after the pull-down; *No. 2* frame immediately before the flicker blade; *No. 3* frame just after the flicker blade, and *No. 4* frame just prior to the next pulldown.

In the pictures the reference bar can be seen protruding into the aperture. The movement of the film can be noticed by observing the position of the numbers in relation to the reference bar at different portions of the pull-down cycle. In the *No. 1* frame, the third column of figures from the left is masked completely by the reference bar; in *No. 2* frame this column of figures has moved out almost into view. In *No. 3* frame, the film appears to be in about the same position as in *No. 2* frame. This is due to the hesitation or even slight retraction of this heat-expansion effect as the flicker blade passes between the light and the film. In *No. 4* frame, the third column of numbers is in full view.

The lateral displacement or change of curl produced by the absorption of heat in the emulsion layer is a normal phenomenon, and takes place with all types of film, *i.e.*, it is the same for fine-grain positive as for the older type of positive, and it takes place to an equal extent in all manufacturers' films that have been tested. It is dependent upon the heat intensity and the density of the image; the higher the heat intensity, the greater is the displacement. Likewise, the greater the density, the greater is the displacement, since more heat is absorbed. Strange as it may seem, the displacement is independent of the natural curl of the film—a film having a high positive curl will be displaced to the same extent as a film with little or no curl.

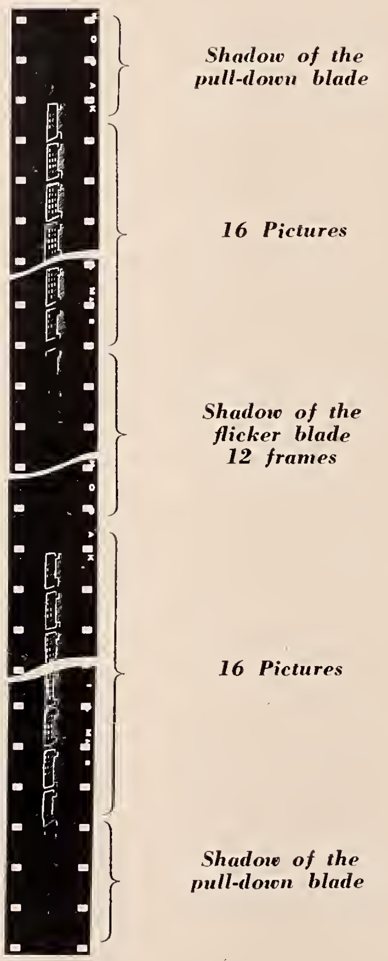


FIGURE 6. *High-speed pictures of 35-mm film in the aperture. The pictures represent the interval from the end of one pull-down to the start of the next pull-down*

(TO BE CONTINUED)

[1] Def. of thermocouple: pair of conductors so joined as to produce a thermo current when the junctions are at different temperatures.

IN THE SPOTLIGHT

By *HARRY SHERMAN*

ONE OF our subscribers from Central New York recently sent us a circular he found in a can of film delivered to his theatre in which the projectionist is requested to help preserve the film in the container by making certain that worn parts in the projector mechanism are replaced. We can readily understand the crying need for the repairs the exchanges are squawking about. but we do not understand why that responsibility should be placed on the shoulders of the projectionist, who can merely recommend replacements and who seldom has the authority to make the actual purchase.

The supply dealers are doing their utmost to help keep the theatres running and are always ready and willing to help the exhibitor in any emergency. but these dealers are also good business men and are not in business for the mere love of it. Many exhibitors throughout the country delude themselves with the thought that their projection equipment will last indefinitely. and merrily go on counting box office receipts without any apparent regard for the maintenance of such equipment. It will be just too bad for them when they are advised by the WPB that their broken down mechanisms cannot be replaced. or when the exchanges refuse them film on account of the damage to prints by their wornout or faulty equipment.

The projectionist does the best he can with the equipment he has on hand and should not be held accountable for damaged prints due to faulty mechanisms. As stated previously, he can only suggest the necessary replacements, but the responsibility of the actual replacement rests with the exhibitor.

● The American Legion has sent out an appeal for cigarettes to be sent to our forces overseas. We all know the "lift" a smoke gives one and it should not require much imagination on our part to realize the importance of a "butt" to a fighting man. The New York State Projectionists' Association has donated many thousands of cigarettes to our boys, and we believe it would be a patriotic gesture if other State Associations or Districts were to follow suit. The appeal of the American Legion should not go unheeded.

● We seem to have reached the stage of stupefication when we permit the teaching of motion picture projection in high schools and even in some public schools. Teaching twelve and fourteen year old boys and girls how to operate projection machines in theatres. so that they may replace projectionists who have been called in service. is a new low. we think. What are the local unions in the vicinity of these schools doing about the matter? We should very much like to know.

● Members of Local No. 199. Detroit, Michigan. were awarded by the regional War Labor Board weekly increases of $5 and $6. depending upon current salaries. This increase which was supposed to become effective September first was "stayed" for a fourten day period pending an appeal to Washington by the minority members of the board who voted against it. Although prior to the WLB decision all the theatre owners in the jurisdiction of Local 199 agreed to the salary boost. a slight suspicion has arisen that a few of these exhibitors might have had a change of heart and opposed the requested increase. However, Roger Kennedy, I. A. vice-president annd business agent of the local. is very hopeful of a favorable decision from Washington.

● Reading between the lines, we detect just a wee bit of nervousness on the part of exhibitors concerning the role television will play in future theatre presentations. Many of them are backing the old "third dimension" idea to offset the encroachment of television in the industry, but whatever else comes we can be certain of one thing—*scientific progress cannot be stopped.*

With the coming of television in theatres, more men will be needed in the

Importance of Country's Labor Laws Stressed at 10th District Meeting

THE 10th District opened its annual convention at the Statler Hotel in Buffalo, N. Y., on August 22. which was attended by delegates from almost every local union in the district in addition to many well-known personages from the labor world.

One of the highlights of the meeting was the statement by I. A. Pres. Walsh that despite all rumors to the contrary an I. A. Convention positively would be held in 1944. in accordance with the Constitution and By-Laws of the International Alliance. The only possibility of postponing 1944 convention plans would be at the request of the government.

Walsh urged the union officials present to attend all district meetings and to keep themselves posted on the labor laws of the country. He stated emphatically that the "no strike" clause should be adhered to by all I. A. locals. as pledged to the President of the United States. He also pointed out that the General Office was at the service of all locals and would be very glad to be of assistance whenever possible.

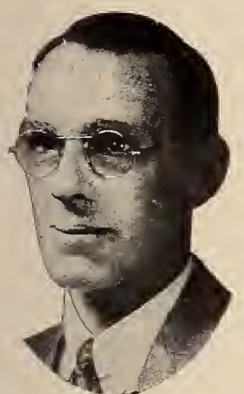
The assembled delegates arose and stood in silence for one minute in memory of the late Harry Brooks, who suddenly passed on just a few days before the convention.

I. A. Vice-Pres. Jimmy Brennan presided at the session. ably assisted by District Secretary Glenn Humphrey. A well-presented extemporaneous report on the legislation of the 10th District and the State Federation of Labor. of which he is an official. was delivered by Tom Murtha. Other speakers included P. A. McGuire. Director of Public Relations for International Projector Corp., Chas. Sinnigen of the Lable Trades Dept., and yours truly.

Bert Ryde. business agent of Local 233, Buffalo, N. Y.. was unanimously elected a member of the legislative committee to fill the vacancy left by the death of Harry Brooks.

projection room. Third dimensional films, which may bring about drastic changes in projection equipment, will also require more manpower in the projection room. Come what may, we seem to be in the enviable position of sitting pretty for a change.

● We were shocked and grieved to learn of the recent death of Harry Brooks, president and business agent of Local No. 285, Troy, N. Y., and secretary of the New York State Projectionists' Asso-



The late Harry Brooks

ciation. We had quite a confab with Harry at the meeting held by the N. Y. State Proj. Assn. about two months ago, and on our desk we have a letter from him dated August second in which he mentions his ill health but is hopeful of recovery. It is hard to believe that Harry Brooks has passed on. To his family we extend our deepest sympathy.

● The Du Mont Laboratories, a subsidiary of Paramount Pictures has applied to the FCC for reinstatement of a commercial television station for Washington, D. C. Yes, it is coming sooner than you think!

● My, my, what changes are brought about by the passing of time. We can recall when our very good friend, Frenchy Biencourt, B. A. of San Antonio Stage Hands local had an aversion for automobiles or any fast moving vehicle. However, we now learn that Frenchy has not only overcome his pet hate but he has become a flying enthusiast and thinks nothing of hopping a plane when making a trip.

● We were very much amused when we read of the plight of a certain wily producer. It seems that the stage crew of the Grand Opera House in Canton, Ohio, owned quite an assortment of electrical equipment which they rented to one Frank Engle, co-producer of a burlesque show playing there. When the house closed down for the season and an inspection was made of the theatre equipment, it was discovered that the switchboard, border lights, wiring and other equipment had disappeared. The boys back stage got busy and decided to do a little sleuthing of their own. In a short time they traced Engle to Boston, where he was about to re-open his show. No time was lost in setting the law on the producer and although not all of the missing equipment was found, the theatre seats, box chairs and other theatre property were located at a second-hand store and promptly returned to the theatre. To the best of our knowledge, no attempt was made to remove the theatre marquee.

● Charlie Garrison, secretary-treasurer of Local No. 456, Denton, Texas, is a frequent visitor to the club rooms of Local 249 in Dallas. Charlie prides himself on his ability to handle the cue sticks on the billiard and pool tables, but when he runs up against such cracker-jack players as Pappy Luther and Julius Schaefer, he finds himself hieing back to Denton with a deflated ego. Harvey Hill usually can be found on the sidelines egging the players on.

● In its investigation of certain "big business" interests, the Truman Committee revealed a story of corruptness that has shocked the American people. The Committee unearthed many foul practices indulged in by these interests, practices that helped swell their tremendous war profits by selling defective equipment to our armed forces, thereby endangering the lives of our fighting men. These exponents of "free enterprise" had no scruples, according to the Truman reports, in selling our country "short" in these critical times and yet, despite the exposure of these practices, many of our leading newspapers attempted to whitewash the accused interests of the charges brought against them.

But, let a union official step out of line and be found guilty of conduct unbecoming to a labor leader, these same leading newspapers would immediately begin a harangue of organized labor. There would be a hue and cry throughout the nation against organized labor, and bills would be introduced in Congress denying labor many of the rights for which it has fought so long and so bitterly. Mind you, we hold no brief for the corrupt union official—he deserves whatever sentence is meted out to him. We do take issue, however, with those newspapers who believe apparently in the so-called double standard—one code of ethics for the moneyed interests and another for labor.

● In line with its promotion-from-the-ranks policy, Altec promoted L. W. McClung, formerly service inspector in the Albany, Ga., territory, to the position of district supervisor, with headquarters in Atlanta. L. Grady Kennedy has been appointed service inspector in the Albany territory.

● *Behind the scenes in a recent theatre fire.* Several weeks ago many of the trade papers carried an item about a fire that broke out during the afternoon's performance in the projection room of a

(*Continued on page* 22)

In attendance at the recent meeting of the N. Y. State Projectionists' Ass'n: Top row (left to right): Raymond Roe, Syracuse; Herman Gabriel, Batavia; Lionel Wilcox, Syracuse; Cal Bornkessel, Rochester; Cletus Messman, Utica; Jack Sealey, Syracuse; Wm. Griffin, Hornell; Louis Goler, Rochester. Center row (left to right): Bernard Willoughby, Amsterdam; Arthur Martens, Westchester; Richard Hayes, Westchester; Robt. Griffin, Cortland; Glenn Humphrey, Utica; Ralph Hayes, Watertown. Bottom row (left to right): Dennis Harrington, Saratoga Springs; James Brennan, New York City; Fred Boekhout, Rochester; the late Harry Brooks; Wm. Colquhoun, Niagara Falls; and I. P.'s Harry Sherman.

Fuses in the Projection Room

By *CLIFFORD D. WELCH*

RCA SERVICE COMPANY, INC.

The author of the appended article stresses the importance of this very small but essential component of the projection room equipment His article appears herein in its entirety, and I. P. has taken the liberty of adding further details on this subject.

THE ordinary plug, cartridge or glass instrument fuse is one of the simplest devices used in connection with projection and sound equipment, but it is occasionally the source of considerable unnecessary confusion. Its very simplicity is likely the cause of its being overlooked. In the event of trouble, it is generally a good rule to look for the simple things first. Even before that rule comes the one to plan ahead.

This, of course, is good logic with reference to all things, but in applying it to all fuse controlled circuits and devices in the projection room, experience suggests the importance of the projectionist clearly understanding the general wiring layout of all circuits, including the location and capacity of all fuses not only in the projection room, but the main fuses elsewhere in the building.

Make a block diagram, similar to Figure 1, showing the circuits and the location of all fuses affecting all booth equipment and hang it in a prominent place where reference may be made to it by the projectionist on duty at the time any trouble occurs. The importance of this may be illustrated by an actual occurrence in a theatre. There suddenly just wasn't any "juice" in the sound system. No one seemed to know why. All fuses known to the projectionist on duty apparently were good. In the confusion the manager neglected to mention that he had turned on an exhaust fan in the basement at the time the outage occurred and the projectionist did not know that the sound system was fed from the same circuit as the fan. The result was an outage when a circuit layout card hanging in the booth would have reduced it to a few minutes at the most. Furthermore a circuit layout card quite possibly would have directed attention to the inadequate rating of the fuse in question, avoiding the outage altogether.

Planning Essential

Plan and practice a methodical course of action to follow in the event of trouble. This can be done thoroughly only by actually observing the conditions that exist when certain parts of the circuits are faulty. Actually remove fuses and observe what effect each has on the equipment. The importance of careful observation and a methodical procedure in trouble-shooting may be illustrated by an occurrence in another theatre.

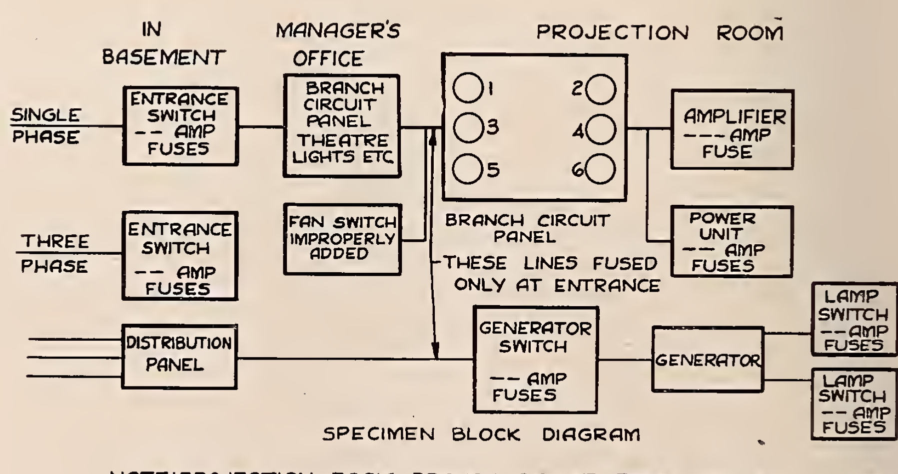
In this case the sound suddenly went off, but when the projectionist looked at the tubes in the amplifier they appeared to be lighted. He looked elsewhere for the trouble and in jumping about from one thing to another changed a branch circuit fuse. Unfortunately when he again observed the amplifier there was no light in the tubes and he was hopelessly lost. To make a long story short, the engineer found that the fuse in the amplifier was open. The projectionist had not taken into consideration that the tubes were of the heater type and would show light for a short time after the current was off.

Examine all cartridge fuses, not forgetting the main feeders. Observe them for signs of over-heating. Polish the ferrules and clips; poor contact is frequently the only cause for a blown fuse. Periodic attention to fuses and clips will pay dividends.

Small glass fuses may appear to be good, but actually may be making only intermittent or no contact at the internal end connections. The same condition may exist on new plug fuses, some of which depend only on pressure contact between the fuse element and the shell.

The three types of fuses encountered in sound systems—cartridge, glass instrument, and plug—are easily identified from their common designation. The first type snaps into fuse clips and therefore depends upon the pressure of the clips on the fuse for circuit continuity. If the clip pressure is too low or the clips or fuse ferrules become corroded, contact resistance is introduced at this point. Resistance means heat upon the passage of current. As the temperature increases corrosion takes place more rapidly and we have a vicious circle which finally ends by the fuse clip breaking or rather burning off. Before this extreme is reached however, in practice, the fuse has probably blown or there is a decrease in voltage in the circuit which is evidenced by poor operation of the circuit.

It is essential that the fuse clips be kept free from dirt and corrosion and that the fuse ferrules be kept clean and polished. Also be sure that the tension of the fuse clips is such that a reasonable amount of force must be exerted to insert the fuse. If the fuse just slides into



NOTE: PROJECTION ROOM BRANCH CIRCUIT PANEL SHOULD CONTAIN CARD SHOWING EQUIPMENT PROTECTED AND SIZE OF EACH FUSE. MARK EVERY SWITCH OF IMPORTANCE - EVERYWHERE.

FIGURE 1

place and does not snap in, the tension is too weak.

Glass Instrument Fuses

The glass instrument fuses are not subject to corrosion as much as the cartridge type because the ferrules are usually nickel or cadmium plated. The ferrules are cemented to the glass and may become loosened and the fuse wire broken. The fuse wire is generally soldered to the ferrule and a poor connection may occasionally be found here.

Glass instrument fuses must be replaced as a unit while there are renewable link cartridge fuses available. In this type the ferrules unscrew. the blown link is replaced and the ferrules screwed into place. This introduces another possibility of trouble if the ferrules are not tight or there is corrosion on the threads. Be sure that the threads are clean and the ferrules tight.

Plug fuses screw into a socket or receptacle in the same manner as an electric light bulb, one side of the circuit being the threaded metal shell of the socket and the other side a spring contact at the bottom of the receptacle. Again corrosion on the center contact of the fuse or on the spring contact or too low tension will cause heat and the old vicious circle starts again. Plug fuses *must* be tight in their sockets and the contacting parts *must* be clean.

Most plug fuses have a visual means of determining whether the fuse is blown, as a window is incorporated in the top of the fuse. When the fuse wire is not blown this window is clear and the fuse wire is clearly visible. When the fuse blows the window becomes more or less discolored. If there is a direct short circuit the window will be so discolored that the interior is not at all visible. If the fuse blows as the result of an overload. the discoloring will be less and the open fuse wire may be visible.

Cartridge Fuses

Some cartridge fuses also have means of determining whether the fuse is blown, others have to be tested. Just because a fuse looks good is not proof that it is good. It is possible that it may have passed the manufacturer's test and yet be found open in the field, or there may be no visual evidence of its being open. If there is any doubt it is always safest to test the fuse. An electric lamp, voltmeter with suitable scale, or one of the neon lamps will give a quick check. If the fuse is good there will be no voltage across it to light the lamps or to show a reading on the voltmeter, assuming the load is connected. If it is open, under the same circumstances, there will be full line voltage across the fuse.

On a rare occasion a fuse that is intermittently open may be encountered. If all indications point to such a condition and it cannot be detected by tapping the various fuses involved, a systematic replacement of all fuses must be made until you prove to your own satisfaction which one is causing the trouble.

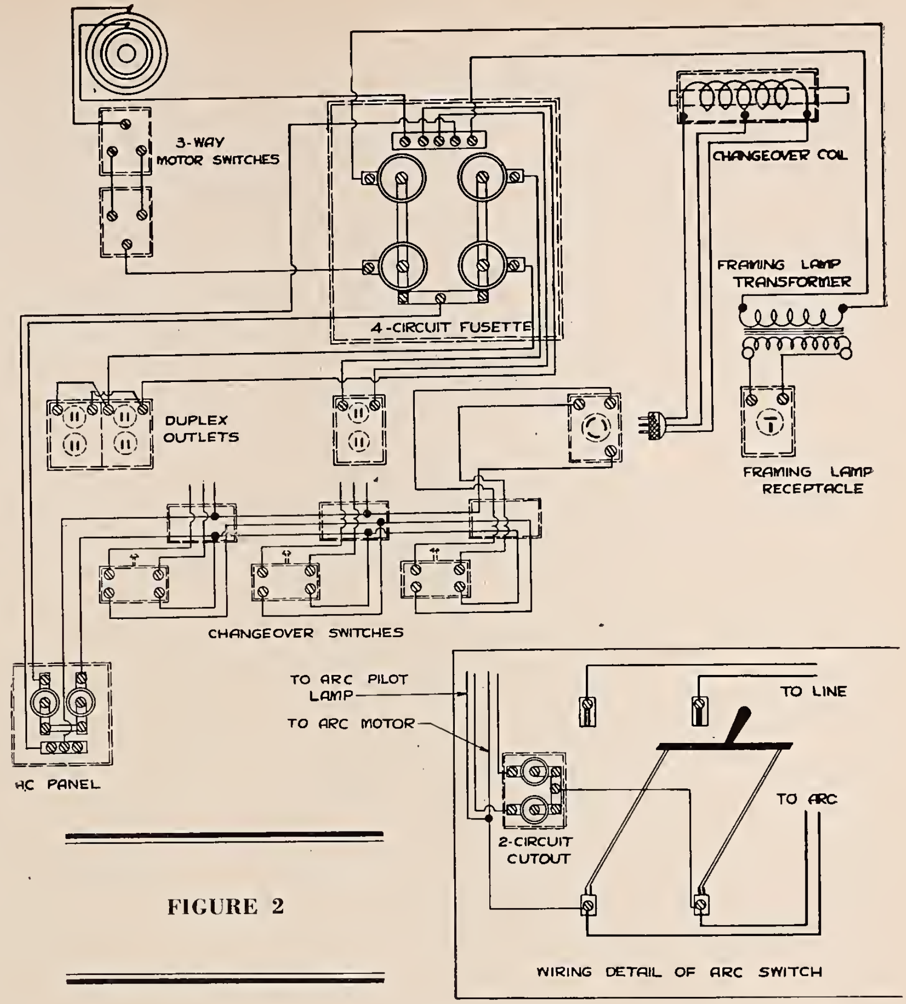


FIGURE 2

Fusetron Gives Real Protection

The type of fuse most generally used depends for its action upon the melting of a length of fuse wire within the fuse enclosure. Such a fuse will carry its rated current indefinitely, although as a fuse ages it has a tendency to blow at its rated current or in some cases slightly below. These fuses are rated to blow on a 10% overload in a certain number of minutes, the time decreasing as the overload increases, until on a short circuit it blows almost instantaneously.

There is another type of fuse which will withstand heavy momentary overloads without blowing and yet will blow on steady loads in accordance with the above. An example of a plug fuse of this type is the "Fusetron". In this fuse the fuse wire is kept under tension by a spring. Under a steady overload the fuse wire softens, the spring stretches it. thus decreasing the cross section of the wire which in turn increases the current density in the wire, speeds up the heating and so the wire parts. On a momentary heavy overload there is not enough heat developed to soften the wire and so the fuse does not open.

This type of fuse is very desirable for the protection of devices which have a high starting current, like a motor and some types of rectifiers. Let us take, as an example, a motor which has a starting current under its normal load of 25 amperes and a running current of 4.5 amperes. A standard fuse of not less than 20 amperes would be required to prevent blowing on the start. If a "Fusetron" or equivalent were used 5 ampere capacity would be adequate, or 0.5 amperes above the normal running current of the motor. It is obvious that the "Fusetron" provides real protection in that if the load increases on the motor and the running current increases above the 5 amperes the fuse will blow before the motor is damaged. With the other type of fuse the current must slightly exceed 20 amperes before the fuse blows. with the result that the motor probably will burn out before the fuse blows. Such fuses as the "Fusetron" are recommended for the protection of any circuit having a

(Continued on page 19)

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random; fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Stopping Oil Leaks

The stoppage of oil leaks around the glass window used for oil level indication on many of the older projection heads is extremely difficult. Projectionist Frank Walker of the Palace Theatre, Lakeland, Fla., resorted to all the known methods with the usual unsatisfactory results, until he hit upon liquid glass. (This may be obtained at any drug store for about 25c a pint.) Just clean thoroughly the place of leakage, scrape the edges slightly rough and then apply the liquid glass. This dries hard very quickly and is leak-proof.—H. R. Davidson, *RCA.*

Improving Tube Contacts

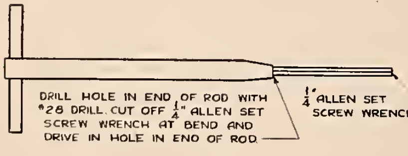
Due to the burning-off of tube prong contacts of the 242 and 211 tubes used in ERPI 43-amplifiers, and to prevent further trouble, empty .22 calibre shell casings should be sweated on to the tube prongs. This makes an excellent contact, easy to keep clean and bright.—E. Spicer, *RCA.*

Conservation of Socket Contacts

With W. E. amplifiers using 242- and 211-type tubes the projectionist can minimize the contact trouble between the tube prongs and the socket contacts by placing on each tube prong of all four tubes exploded .22 calibre short shells. Polish the end of a shell and be sure that the shell is squeezed tightly on the prong. This gives added contact surface between the tube and the socket contact spring. —N. Spock, *RCA.*

Allen Set Screw Wrench

An improved wrench made by drilling the end of a rod and inserting a part of



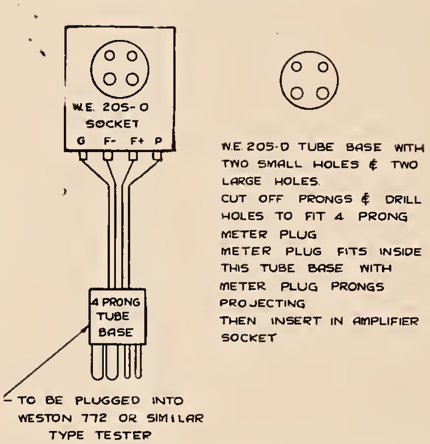
an Allen Set Screw Wrench, will be found very helpful when removing or replacing Stock No. 23677 motor couplings.—A. N. Kidwell, *RCA.*

A Soldering Job Made Easier

When working alone it is often difficult to do a soldering job and at the same time direct a flashlight beam where needed. I found that by placing the flashlight on either shoulder, under my coat, plenty of light can be played on the working area and the hands are left unencumbered.—R. H. Bisbee, *RCA.*

Adaptor for Checking 205-D Tubes

I found that certain of the W. E. sound equipment does not have meters for checking tubes. Below is a drawing of an



adaptor that I made to be used in conjunction with the Weston 772 test instrument. This adaptor also works very successfully in checking 205-D tubes.—C. W. Stelling, *RCA.*

Rejuvenating Flashlight Cells

In these trying times, an idea for rejuvenating flashlight cells is not amiss. The d.c. voltage drop across the average ballast resistor in the arc circuit varies from 6 to 8 volts upwards. This can be adjusted by tapping the rheostat or by inserting a series resistor.

In any event, two wires are run out and the ends are pressed against any flashlight cell that has had normal use and will just redden the filament of the flashlight lamp. The positive wire is touched to the positive battery terminal and the negative wire to the negative terminal. A shot of from one to five seconds or a series of shots totaling ten seconds will be found ample to put lots of pep back into a cell. The cells will heat slightly from this treatment and this warming is an indication that the chemical action is taking place.

The result is unlike a cell simply put on a shelf to acquire a false rejuvenation. About fifty percent of the new energy is restored and a cell can be rejuvenated several times. A storage battery of 6 volts is also a good source. Definitely dead cells do not recuperate. —A. F. Schneider, *RCA.*

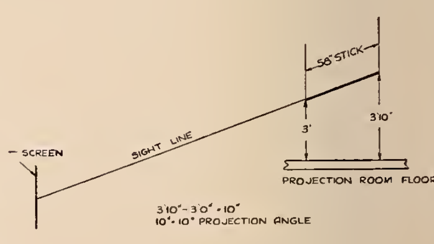
Simple Method of Measuring Projection Angles from 1 to 25 Degrees

Some fifteen years ago, while flaring 15-type horns, I noticed that each inch of flare was also equal to one degree. I do not know whether this condition was engineered or just happened, but it does provide a good method of accurately measuring angles.

To measure angles from 1 to 25 degrees, mark off the 58 inches on a stick. The difference in inches that the ends of the stick are away from a surface is the angle the stick is to the surface.

This method can be used for measuring projection angles. The center of the screen is sighted with a stick 58 inches long. The difference in distance in inches from the ends of the stick to the projection room floor is the projection angle in degrees.

To check the accuracy of this method use a slide rule. Place the 90-degree mark of the sin scale on 58 (right side)



of the *A* scale. It will be found that each degree from 1 to 20 degrees will fall exactly on the same number on the *A* scale. It will fall very close to 25 degrees; at 30 degrees the number will be 29, and this is not far off. Above 30 degrees the alignment of the two scales will be too far off to use.—C. H. Atchisson, *RCA.*

Conservation of G-112-G Drive Gear

A modified G-112-G gear (which has an outer hub designed to accommodate

(Continued on page 24)

FUSES IN PROJECTION ROOM

(*Continued from page* 17)

high starting current and will, of course, provide excellent protection in all circuits.

Why Fuses Are Necessary

Fuses are required in circuits for two reasons, the protection of equipment and the prevention of fires. When a circuit is heavily overloaded it means that the feed wires are warmer than they should be. It is granted that a slight overload probably will not cause overheating of the wires with a resulting fire, but the copper conductor and the insulation used in a given commercial wire is designed to be used under very definite conditions. For example, No. 14 B&S gauge braided rubber covered wire is designed to be used in circuits carrying up to 15 amperes. It should be fused with not more than a 15-ampere fuse. Larger and smaller sizes of wire carry similar ratings and the fuse should not exceed the rating.

Suppose a circuit is constantly heavily overloaded over a period of time. What happens? The temperature of the conductor is higher than that specified by the manufacturer. This heat is transferred to the insulation and the heat causes the insulation to deteriorate rapidly. The rubber and fabric used in the insulation is not designed for these comparatively high temperatures. This means that the rubber and the fabric become brittle and in due time fall from the conductor. The bare conductors then may short to each other or to the metal conduit in which they are contained. Fires have been caused by such a condition. Hence we see how vicious is the practice of putting a penny behind a plug fuse. If a fuse of proper capacity continues to blow in a circuit there is something radically wrong and the cause should be found before the circuit is used again.

To further insure proper fusing of circuits a special type of fuse called the "Fusestat" was introduced a few years ago. This device works on the same principle as the "Fusetron" but requires a special socket. The "Fusestat" has a different thread from the regular plug type fuse and cannot be inserted in a regular fuse receptacle. Adapters are available which permit the conversion of regular receptacles and these adapters lock into the socket and can not be removed without destroying the receptacle. The special sockets are interchangeable with the standard fuse receptacles. A further feature is that a given receptacle will take only "Fusestats" within a certain range of capacities. If a circuit is

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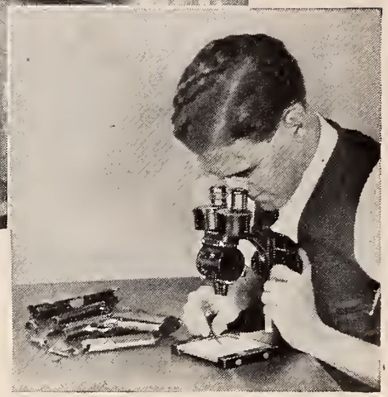

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properly fused initially, that is, the proper socket is installed, it cannot be over fused at some later date and neither can a penny be placed before the fuse.

Fuses Should Be Centralized

Another important point is the centralization of fuses. There are installations where we find a fuse box here and another one there. So in case of trouble it is a case of travel from one box to another to determine which circuit is causing trouble. Much of this may be overcome by the posting of a circuit card in the projection room. But it would be still simpler if, in addition to the entrance fuses located at the meter and all projection room fuses in the projection room, all other fuses were in one box conveniently located at some accessible point in the theatre.

With regard to the centralization of fuses, Loew's Inc., have designed a standard method of locating the fuses for all of the equipment mounted on their Super-Simplex pedestals. The circuits included, and shown in Figure 2, are the arc pilot lamp and arc motor, the E-7 threading lamp, changeover, projector drive motor and convenience outlets. The first two circuits are taken care of by a two-circuit cutout mounted in the arc switch housing. The other circuits are covered by a four-circuit box mounted inside the pedestal on the non-operating side and accessible by means of a door in the pedestal. Thus if trouble occurs in any of the circuits in the pedestal the projectionist can check the pedestal immediately.

Note that the arc motor and arc pilot lamp are separately fused and that the two circuit cutout is located in the arc switch. The AC to the pedestal is divided into two fused circuits, one for the changeovers only, while the other circuit feeds the projector motor and the six convenience outlets on the pedestal. But the motor circuit, projector mechanism. and convenience outlets are fused separately so that failure in one circuit will not render the other circuits inoperative.

It is especially important to have any convenience outlet fused separately since portable appliances. such as trouble lamps. soldering irons. and test equipment are subject to cord trouble. It is in these portable devices that trouble due to broken cords and stray strands of shorting wire are to be found and can cause difficulties. While this type of circuit arrangement can not be introduced into all installations, the principles illustrated may be applied in more or less degree to a large number of systems and will be very helpful in eliminating outages and will localize any power circuit troubles that do occur.

Altec Studies Post-War Changes

The growing importance of electronics as a science is receiving world-wide attention and the Altec Service Corporation is tackling the problem objectively, highlighting the subject in a folder it has published entitled: "Let's Get Down to Brass Tacks About Post-War," for the exhibitor and his post-war problems. The work is signed by L. W. Conrow, president of Altec Service Corporation.

"Exhibitors are being told," the folder sets forth, "that by tying up with such-and-such a company (at the same time giving such-and-such a company their money now), exhibitors can guarantee themselves an inside track on all the things they will need to compete successfully in the post-war era. A number of organizations, both large and small, have developed thoughts along this line, and most of these thoughts include the exhibitor's parting from some money now to be applied to purchases after the war.

"The general picture of the post-war is painted in such miraculous terms that a considerable number of exhibitors have become a bit bewildered by it all, and you can't blame them."

The folder points out that in order to see where things are going it's good sense to see where they are now, and reviews obstacles that exhibitors have overcome during the war emergency. The post-war period, the study continues, isn't going to change the exhibitor's business acumen, and it isn't going to change his market, and in discussing technology it takes radar as a starting point, the perfection of which is described as the composite product of many minds.

"Now this business of radar is, in a sense, typical of what is going on throughout the length and breadth of electronic development," Mr. Conrow states. "Whenever anybody begins to talk about electronics as his own baby, just remember that electronics is a science in which many scientists are working, and which many companies are using to produce useful electrical products.

"Altec Service and Altec Lansing only claim that they have learned certain ways of dealing with the facts of electronic science in such a way that the armed forces have called upon them for certain jobs both in research and manufacture, that they seemed best qualified to tackle. Altec Service and Altec Lansing have worked in the warmest and most sincere collaboration with scientists in universities, in manufacturing companies, and the research technicians of the armed forces."

In answering the question: What does all this post-war planning come to? the company states it adds up to this:

"The changeover from wartime production to peacetime production is going to take time, and there will be many companies with useful wares to sell. Exhibitors will have plenty of time to see all the wares, all the developments, and pick and choose among those which seem best able to do a good job in the theatre. They won't have to buy any pig-in-a poke merchandise; it will all be laid out for everybody to see and judge."

• BUY WAR BONDS •

IN THE SPOTLIGHT

(*Continued from page* 15)

theatre in Everett, Mass. Great emphasis was placed on the heroism of the girl cashier who prevented a panic in the theatre by calming the patrons, most of them children, and leading them to safety. Mention was also made of the heroic rescue by the assistant manager of the projectionist who was trapped in the projection room trying to fight the flames.

BUT, and this is significant, no mention was made in any of these exhibitor publications of the investigation that followed the fire. Here is the aftermath of that investigation.

When a state inspector called at the theatre to investigate the cause of the fire he was informed by both the theatre owner and the projectionist who was rescued that the second projectionist working on that shift happened to be in the washroom when the fire broke out, and remained there the entire time unaware of what was going on in the theatre. (It must be remembered that the State of Massachusetts pioneered in enacting the two-man per shift bill.) A clean bill of health, therefore, was given both the projectionist and the exhibitor.

Chief Parsons, of the Department of Public Safety, however, was not completely satisfied with the inspector's report. He could not understand how the second projectionist on duty could have remained in the washroom oblivious to all the excitement. He requested the theatre owner to give him the name of the second projectionist on duty, his social security number, and asked to see the theatre payroll records so that the employment of the second man could be verified.

The projectionist on duty when the fire broke out finally admitted from his hospital bed that he was the ONLY man on duty and the story about a second projectionist was concocted to protect the owner. The license of the projectionist (who had been operating a machine only since June) was revoked and the owner is now awaiting a hearing on charges of operating a theatre with a one-man shift in the projection room.

It is the old story—the safety of the public be damned. Mr. Exhibitor is always ready with the old crying act—bad business, shortage of projectionists, etc. It seems strange that the largest circuits do not have any trouble in finding projectionists for their theatres; this difficulty seems confined only to those circuits that are known for their labor-baiting, penny-pinching tactics.

● John A. Krulish, employed by the International Projector Corp. for the

(*Continued on page* 25)

NATIONAL THEATRE SUPPLY NAMES NEW AD, PUBLICITY HEAD

A. J. Lindsley has been appointed to handle advertising and publicity for the National Theatre Supply Company, according to an announcement by W. E. Green, president of the organization. Mr. Lindsley, who was with the International Projector Corporation, assumes the duties of F. L. Friedman, resigned.

A Few Post-War Facts

THAD C. BARROWS, PRESIDENT, L. 182, BOSTON, MASS.

REPORTS from the many theatres of battle are very much in the Allies' favor these days, and although the war is far from ended it is not too soon to begin laying plans for the many changes that are in the offing for the post-war days.

We all remember how everybody cheered, waved flags, and in many instances gave parties for the boys when they entered the services of our country. We also remember the deep spirit of patriotism that filled the hearts of many employers when news of the bombing of Pearl Harbor was flashed throughout the country. Yes, they fervently declared, all their employees who enlisted with Uncle Sam's fighting forces were guaranteed their jobs when they returned to civilian life.

Well, many of these men have already returned from the fighting fronts, honorably discharged from the service, only to find their positions taken by others. Promises are easily forgotten; it seems that certain employers conveniently forget when they find it conflicting with their purse strings.

Members of the International Alliance now serving with the armed forces do not have to worry about broken promises. Every I. A. local union has pledged itself to return to every man the position he held prior to his enlistment. In many cities it will be the duty of those in power to find employment for the thousands of men who will return home after the cessation of hostilities and who will rightfully expect some reward for the hardships endured on the battlefronts.

Facts must be faced. We know that thousands of men have been trained as motion picture projectionists by the army and navy, and no small number of them will seek employment in our craft. I feel that it is our duty to take care of as many of these men as possible by admitting them to membership in the I. A.

In my opinion, the first and most important step is the abolishment of one-man operation in the projection room. This can be done if we agree to place in the projection room of every theatre now having a one-man shift a returned service man who will work together with the regular projectionist on the job. In so doing we will not only give the ex-soldier or sailor a chance to rehabilitate himself, but we can also assure the patrons of these theatres a greater measure of safety.

In the past year there have been a number of projection room fires due, no doubt, to one-man operation and the employment of inexperienced projectionists. The Cocoanut Grove disaster in this city last year where 495 people perished and scores more were injured still lingers in the minds of many people. Although this club was located in a one-story building and had exits leading into three streets, the tremendous loss of life was due in a large measure to the panic caused by the sight of flames. The fire hazard in the projection room can be greatly minimized by the employment of the two-man shift. We must not adopt a smug attitude and say IT CAN'T HAPPEN HERE!

DeVry Sponsors Design Contest for 8-mm Equipment; Seeks Amateurs' Aid

William C. DeVry, president of the DeVry Corporation, son of the late Herman A. DeVry, inventor and manufacturer of the first portable motion picture projector, which brought movies to the classrooms and crossroads of the world, has issued a widespread invitation to professionals and amateurs to participate in a general 8-mm motion picture camera and projector design competition.

The competition started Sept. 1 and will close on Dec. 31, 1943. Awards of $1,500 in U. S. War Bonds will be made for camera design and mechanical ideas, including overall redesigning of both camera and projector and suggestions as to the mechanical refinement of both units—ideas that make filming and projecting simpler and easier—ideas that may reduce the cost of manufacturing this equipment, thereby increasing the size of the market.

Mr. DeVry states that the competition is launched in response to scores of letters he has received from movie makers asking what mechanical developments in motion picture equipment can be expected out of the war.

"What 8-mm development needs," he said, "may be a complete redesigning of both camera and projector to fit them to the needs, desires and uses of the average amateur motion picture enthusiast. We hope the amateur will give us for his equipment the kind of cooperation we had from Hollywood cameramen and theatre projectionists in developing our professional line."

Widespread improvements are possible, it is pointed out, on devices whose efficiency is taken for granted. "Maybe we've taken the efficiency of these for granted," Mr. DeVry continued. "Suddenly some user leaps the barriers and gets the ear of a manufacturer with an idea that revolutionizes the industry. We're inviting that kind of ideas."

AT YOUR SERVICE

(*Continued from page 18*)

a spring pawl and ratchet) became loosened and the cause was traced to stripped threads in both the screw and shaft holes. This, in turn, was caused by the bent pawl which did not properly engage the ratchet. Allowing this gear to wobble and run with the loose retaining screw impaired the threads, and made it necessary to install a new shaft. A periodic checkup would have prevented such damage.—A. F. SCHNEIDER, *RCA.*

Emergency Operation of W. E. 86-Type Amplifier

Should the filter capacitor in a W. E. 86-type amplifier fail to operate properly, the filter capacitor from the stage, which is normally strapped out, may be used in its stead.—R. S. SEAR, *RCA.*

Copper Dripping Collection Box

You will save your reflectors by placing in the ash tray a small tin box with a hole in the cover just large enough to allow carbon copper drippings to pass through. Instead of hitting the metal ash tray and splashing back on the mirror, the copper drippings will be trapped by the cover.—FRANK HAMRE, *RCA.*

Operating with Stripped Gears

Occasionally one is up against it for a gear replacement made necessary by the stripping of several teeth. If the stripped gear is fairly wide—such as a drive gear—a temporary repair may be made by sawing it in half and then turning the two halves in such a manner that the broken teeth are opposite each other; that is,

(*Continued on page 26*)

IN THE SPOTLIGHT

(*Continued from page 22*)

last 30 years, and a member of Local No. 306, 25-30 Club, the S. M. P. E. and several other motion picture organizations, recently became the grandfather of a baby boy—George D. Haas. Krulish is very much the proud grandpappy these days and can be seen strutting about handing out cigars in honor of the new member of the family.

● *Signs of the times*: Wm. M. Borland, manager of G. E.'s Western Electronic Department, reported in a talk before the Frisco Advertising Club, that plans are now in order for seven television stations on the Pacific coast—three for San Francisco, and four for Los Angeles.

The Paramount, Palace and Warner Theatres in Youngstown, Ohio, have already installed special television wires for "news broadcasts."

Famous Players Canadian circuit announced that television will be an "added attraction" in its theatres when the war is over and won.

● Steve Kopcak, secretary of Local No. 287, Beaver Falls, Penna., recently declared that four members of his local union have been called in service—J. Heymann, J. G. Srafin, L. Reno, and C. Balutez. Balutez was reported killed in action several months ago.

● Many New York State I. A. Local delegates also served as committee members at the State Federation of Labor meeting which was held simultaneously with the 10th District Convention. Eddie Stewart, who has represented Local 306 for the past 20 years, was one of the oldest delegates present, judging from the point of service. Other 306 delegates to State Federation of Labor and 10th District meetings were Herman Gelber, Morris Kravitz, Ben Scher, Nat Doragoff and the writer.

● A salute to the service inspector. He is usually quiet, unassuming and intelligent. He does his job in a workmanlike manner; is always on tap when needed. The theatre projectionist will find him cooperative and helpful at all times. As a general rule, the service inspector is a former projectionist, member of the I. A., and then again he may be doubling up with his regular projectionist job. The serviceman and the projectionist is truly an unbeatable team in any theatre!

● Robert P. (Bobby) Burns, executive board member of Local 110, Chicago, Ill., is now Lt. Burns, senior grade, of the United States Navy. Bobby is a Radar expert and is at present engaged in important work in Washington, D. C. His fellow members of Local 110 are extremely proud of Bobby, as are the rest of the I. A. members throughout the country.

● Lt. Col. Ford D. McParland, commanding officer of the Third Batallion of the 210th Coast Artillery, Anti-Aircraft Division, is a member of Local No. 199, Detroit, Michigan, and for many years prior to his enlistment with the armed forces at the outbreak of the present World War, worked as a projectionist at the Crystal Theatre in Detroit. Local 199 is extremely proud of the honor conferred upon one of its members, and this pride is shared by all other members of the Alliance.

● Morrie Seamon, secretary, Theatre Treasurers Local No. 751, is the right guy to contact when wishing to make railroad reservations. Should any of our readers find it difficult to obtain railroad accommodations, do get in touch with either Morrie or Jimmy Murphy, president of Local 751, and your troubles will be over. Be sure to specify your preference for *Car A, Drawing Room A*—these boys seem to have a priority on first-class accommodations.

AT YOUR SERVICE

(*Continued from page* 24)

one half of the gear with the broken teeth will be on one portion of the outer circumference and the other half will be at another portion. This will give a half tooth-bite at each side and the gear will track normally. A stripped gear repaired in this manner was satisfactorily used for several weeks.—E. M. KARCHER. *RCA.*

Adjusting Optical Units on W. E. 211 Sound Heads

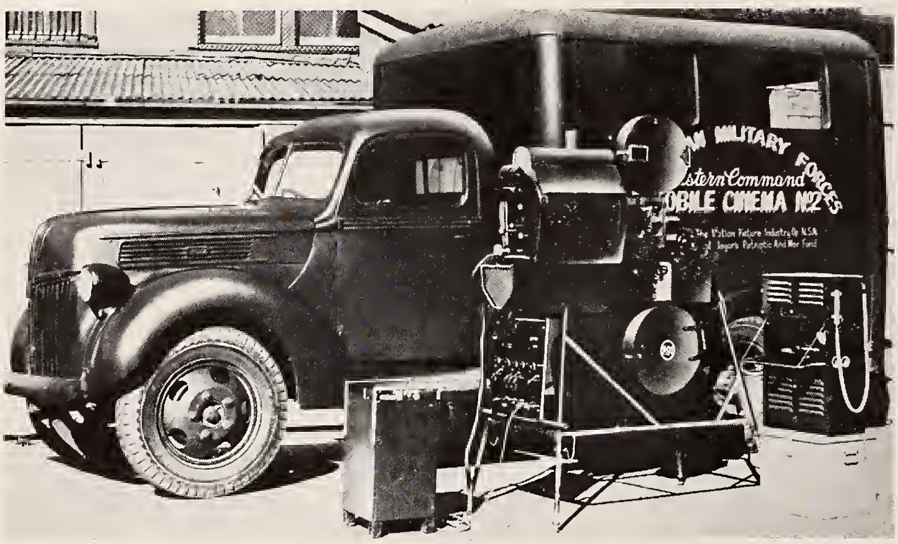
Care must be taken in adjusting optical units on the W. E. 211 sound heads as there are several peaks that are obtainable when running film and using output feeder. In order to make certain that the maximum peak is obtained, three peaks are obtainable on each side of the maximum output reading, and the optical units should be run through all peaks. If the proper peak is not hit there will be a very decided drop in response to around 3,000 cycles, but above this frequency the response will be almost normal.—E. DENEUF, *RCA.*

THIRD DIMENSION FOR SCREEN DISCUSSED BY COE

American motion pictures which show the actual lives of free people everywhere will combat whatever propaganda might be hidden in ideological pictures produced abroad, according to Charles Francis Coe, vice president and general counsel of the Motion Picture Producers and Distributors of America, who addressed an audience of Eastman executives and workers in Rochester recently.

Mr. Coe said that the field of visualization has expanded greatly. "Recent animated drawings indicate to me," he continued, "that no subject is so abstruse as to deny itself clear expression on film. The graphic element of the motion picture will be added to the written and spoken word." He also predicted that even greater effects will be achieved when a third dimension is added to the screen.

RCA Photophone Units Cover Wide Areas in Australia



REMOTE battle stations in Australia are enjoying sound pictures as part of the Army's entertainment-for-morale program, aided by portable RCA photophone equipment especially designed for the rugged job "down under."

The mobile units, staffed by experienced projectionists selected from the armed forces, travel thousands of miles under difficult conditions, with their performance hailed enthusiastically by the troops. RCA Photophone of Australia, a subsidiary of RCA, supplied the equipment to the Australian military forces. Easy dismantling of the equipment and parts-within-part packing for moving purposes, are features of these theatres on wheels.

The unit stands of the photophone equipment are of tubular metal and so constructed that one section fits within another to make a compact and steady package. The soundhead and projector are in one unit, while the screen frame is made of metal tubing and is in eight sections which fold together. As all performances are out of doors, an unperforated screen is used, with the speaker erected atop.

In order to provide for varying conditions in various localities, the equipment is provided with a series of lenses, with the interconnecting cables mounted on drums and rotated between the legs of the portable stands.

The projectionists, who are accorded much credit for the success of the units, since they often work under the most trying conditions, are former operators who have enlisted in the armed forces from the film industry.

THIS IS NUMBER **15** OF A SERIES OF ADVERTISEMENTS SPONSORED BY THE INTERNATIONAL PROJECTOR CORPORATION MANUFACTURERS OF *Simplex* EQUIPMENT IN COOPERATION WITH THE NATIONAL CONSERVATION PROGRAM

"Keep Equipment Operating at Peak Efficiency in this Emergency!"

—*says* R. H. McCULLOUGH

R. H. McCULLOUGH
General Purchasing Agent and Supervisor of Sound and Projection Fox West Coast Theatres

"RIGHT NOW we are up against the hard, blunt facts of war and the grim necessity of winning it. In this great emergency it is important that we gear up inspection and maintenance to prolong the life of all equipment. No one knows just when replacements will be available.

Keep everything in good repair to prevent breakdowns. Your job is more important than ever before to provide good and well presented entertainment for public morale and the war effort.

Our future as a nation is at stake and in characteristic fashion we must respond and pledge conservation. Let us keep our equipment operating at peak efficiency at all times!"

R H McCullough

NATIONAL THEATRE SUPPLY DIVISION

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

Simplex

INTERNATIONAL PROJECTOR CORPORATION
90 GOLD STREET, NEW YORK, N.Y.

INTERNATIONAL

PROJECTIONIST

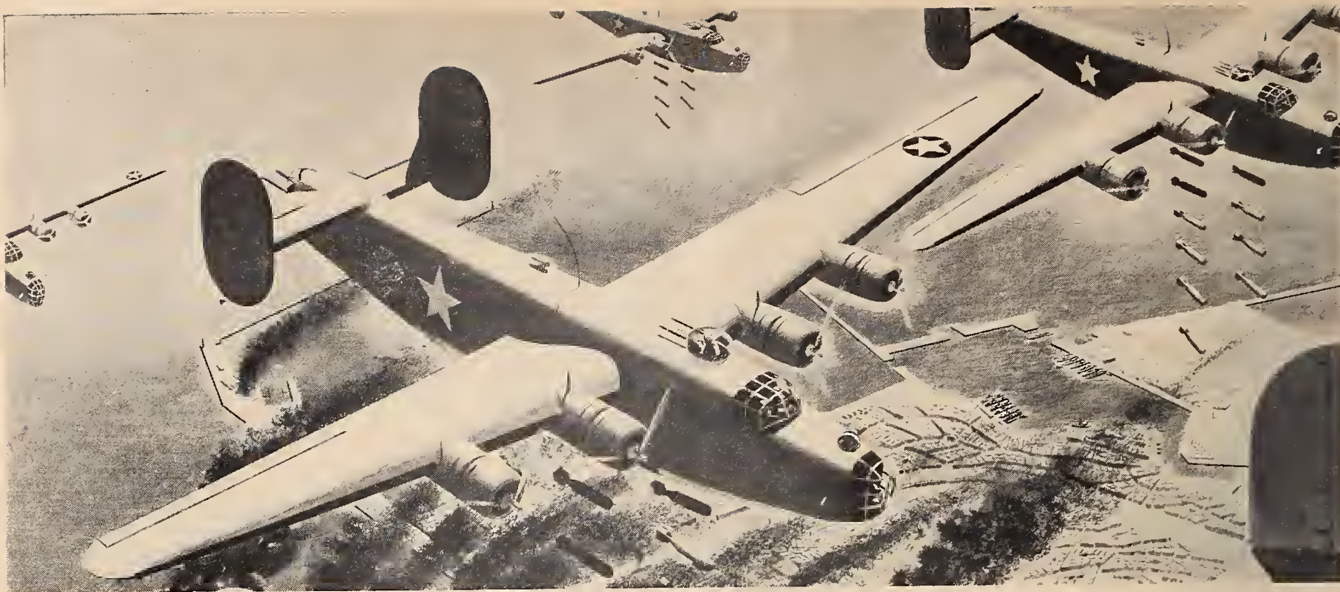
OCTOBER 1943

VOLUME 18 • NUMBER 10

25c A COPY • $2 A YEAR

TO PROJECTIONISTS!

Visitron cells are available for every type of sound projection equipment. Theatre supply dealers can advise the correct cell for your equipment. Buy from your supply dealer. If you wish to have your old cells tested without charge, write to G-M Laboratories, Inc., for instructions for shipping. Information furnished promptly.



INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

C. F. Alexander, *Technical Editor*
W. L. Lightfoot, *Associate Editor*

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Monthly Chat

IT IS good news that the Third War Loan went way over the top but, of course, everyone knew long before the drive started what the outcome would be, even those military maniacs of the Axis powers who precipitated the need for the tremendous outlay in the balance of the world's fight for freedom. But, even so, it's grand news. However, dollars in themselves cannot win the war. The human effort to win is even more important and essential. Every individual must plan and do his work in the most efficient manner to conserve both time and materials, for the waste of either or both is of direct and immeasurable aid to our enemies. The production of war materials has reached fantastic figures but greater production is sought and it is up to everyone to give every minute and dollar gladly until the last shot has been fired.

• • •

We are told that after the war we will be using water pipes made of clear plastic. This material can be worked more easily than the metals usually used. It can be formed readily, bent around corners easily, and joints made simply. Still another plastic can be produced that can be used as a liquid, rubbery material or a solid. So many of the new plastics are not affected by weather, oils, acids or other corrosive agents that their use will be a boon to mankind. Those of us who have the responsibility of the maintenance of a house will go for these products in a big way.

• • •

There is a bottleneck in manpower, however, with no solution in sight. Interesting is a new incentive plan that has just been introduced in one of the Eastern airplane plants, designed to increase production. More of these plans will be tried, but if they do not work out, drafting of manpower would seem to be the only solution. While we may object to being told where to work as it is not the American way, it would be infinitely better than the Axis way—the slave labor way—and if such an order is forthcoming we must meet it cheerfully and willingly.

• • •

Letters written to the editor of I. P. have been more than usual in number lately and it has made the editorial staff feel good. Included have been many worthwhile service tips and suggestions for improving operations. It is a pleasure to pass along these ideas so that all may benefit. In the exchange of information we all become more adept. It is an old story but always worth repeating, and we hope that this mail will become even heavier in the future. Why don't YOU help by sending in YOUR ideas?

INTERNATIONAL PROJECTIONIST

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Selection and Maintenance of Switches

By *HENRY B. SELLWOOD*

Herewith is presented an outline of some of the special features of 16-mm film and equipment, with particular emphasis on the differences between them and their 35-mm counterparts. A flourishing field of activity before the war, 16-mm holds out every promise of vastly increased importance in post-war days. It may offer the projectionist large new opportunities or strong new competition. It is decidedly not a development to be ignored

WE RARELY give much thought to the important functions of the switches incorporated in the projection room equipment until trouble is encountered. Then there is the usual queston as to why the trouble occurred and why a different type of switch was not used so that there would not be a failure. We cannot get away from switches entirely; they not only are required to control the current in the circuits, but also act as a safeguard against accidental contact with high voltage during servicing.

It may seem at first glance that the type of switch used in a given circuit is not too critical, but that is not the case. Switches usually are designed for a particular service and if that switch is used for another class of service it may give continual trouble until it is replaced by one suitable. There are certain fundamentals involved in switch design and once these are understood the selection of the proper switch for a given service can be made with confidence.

Power and Speech Switches

Switches, for projection room applications, may be divided into two general classes—power and speech. These two classes may be broken down into types, such as knife, toggle, slide, key and rotary. Power switches, as the name implies, are used in circuits transmitting watts or kilowatts of power either at high or low voltages, whereas the term "speech switch" applies to those devices used for switching purposes in the speech circuits of amplifiers or similar equipment. Many of these latter circuits transmit minute quantities of power and consequently the current and voltage are very low.

The first type of power switch that comes to mind is the knife switch so commonly used in the arc lamp circuit. In this type of circuit relatively heavy current is encountered. The switch blades and the contacts must be of sufficient area so that heating at the point of contact will be avoided; also the pressure of the contacts on the blade must be adequate to reduce contact resistance and prevent heating. These switches are always rated for current and voltage and if the manufacturer's recommendations are followed they will perform satisfactorily initially. But the blades and contacts must be kept clean and free from pitting. Once these parts begin to show pitting or burning, the life of the switch is shortened as the contact resistance increases and this condition is accelerated.

These switches always should be opened and closed quickly to prevent the possibility of arcing. This is particularly important when breaking the circuit, as the circuit voltage tries to maintain the current flow. Heavy duty switches are equipped with a quick break device, which in its simplest form consists of a second blade hinged to the main blade and normally held against the main blade by a spring. When this type of switch is opened, the main blade is pulled out of its contact and when it reaches a predetermined point the second blade is snapped out by the spring. This quick action prevents drawing an arc. Safety starting switches, in their simplest form, usually are of the knife type and many incorporate this quick-break principle.

Use Manufacturer's Rating

Toggle and rotary switches are used in power circuits to start amplifiers, rectifiers and motors, and also in the plate and heater supply circuits. Here again the manufacturer's rating should be the guide as to the application in the starting of devices. But for most satisfactory service the toggle switch should have the knife switch principle. This

provides a wiping or self-cleaning type of contact.

There is another type of toggle switch with a roller that closes the circuit by pressure against the contacts and which is widely used in radio sets. This type is not self-cleaning and has a shorter life.

Silver-plated contacts are more satisfactory than unplated contacts of either copper or berylium copper. Still more satisfactory is a laminated material consisting of coin silver and berylium copper. The copper provides the necessary spring and, therefore, tension, and the silver furnishes the electrical conductivity. Such switches were available before the war on special order and it is to be hoped they will become standard after the war, unless, of course, a still better material is developed.

Some toggle switches can be taken apart for inspection, adjustment and cleaning. Care must be taken, however, to disassemble them with due regard for the many small parts inside or they never will function again. It would be well to experiment with a spare switch first before going to work on one of the equipment switches. A very small amount of light grease may be applied to the contacts, but it should be borne in mind that grease always tends to pick up any dust and grit flying around in the air. So it is better not to apply the grease if the switch is exposed to such an atmosphere, on the basis that grit increases wear more rapidly than normal operation of the switch.

Maybe some of you have had burned contacts on your sound system motor starting switch; in fact they have to be replaced all too frequently. If the switch is properly rated for the service, short life may be due to the practice of using the motor switch to run down the film after threading. This practice may result in opening and closing the switch several times before the motor is up to speed.

If we remember that the starting current of a soundhead motor is of the order of 25 amperes and the running current probably not more than 5 amperes, it is easy to see that the switch is opening a circuit carrying much more than normal current. Under such circumstances the switch cannot be expected to stand up. While such switches are of the quick-acting type, a heavy arc will be drawn every time the switch is opened in the running down operation; this heats and burns the contacts. Anyone who insists on continuing this practice must expect to have switch failures. He can prolong the life of his switch by frequent inspection and by keeping the contacts free from pitting and burning.

Watch Oxidation

When toggle switches are used in plate and heater supply circuits the problem is somewhat different. In the first case we have a high voltage, low current circuit, and in the second case a low voltage, high current circuit. Poor contact in both cases will result in noise. There may be burning eventually and then failure. For this use the knife switch type of contacts is very necessary and, furthermore, silver-plated contacts or those made of the laminated material mentioned above are necessary.

Non-conducting oxides form on most metals when they are exposed to air. These oxides increase the resistance of the circuit to the point where current will not flow unless there is sufficient power in the circuit to break down that oxide. Silver forms a conducting oxide and therefore is ideal for this purpose. Unplated contacts in plate circuits give more trouble than in heater circuits, but there is evidence of trouble from this cause in heater circuits. If unplated contacts are used in speech circuits, continual trouble will be experienced unless the contacts can be cleaned frequently. We can say that silver contacts are a "Must" in speech circuits.

Rotary switches frequently are used in power circuits when sequence operation is required; for example, in amplifiers employing gas tubes that have to be heated before the plate is turned. Generally, standard switches can be used for this application as the power is sufficient. However, frequent inspection and cleaning of the contacts will prolong the life of the switch, if at the same time the contacts are kept adjusted so that there is adequate pressure. The contacts on most of the switches are of the knife switch type, which is most desirable, as previously mentioned.

Different types of rotary switches are used in speech, and plate and heater supply circuits. Contacts should be of the self-cleaning type and definitely should be silver. Many switches of this type are used in the radio industry but, generally, these are not rugged enough to give satisfactory service in the projection room. This is a point to remember in obtaining replacement switches if you expect the switch to last. The better types of switches in this class require very little maintenance and have an exceptionally long life. They do not appear as rugged as many of the toggle switches, but that is deceiving as they will perform better.

It seems to be a common belief that the higher the current rating of a switch the better its performance will be in any circuit. But a switch developed for power circuits will be apt to cause all kinds of trouble when used in a speech circuit. For one thing it probably will have unplated copper or berylium copper contacts. Also it may not have self-cleaning contacts. Switches that have been especially designed for speech circuits should be used in such circuits so as to avoid complex maintenance problems.

Slide Switches Rugged

Slide switches are in the same class as toggles and the same considerations apply. These switches have found their widest application in laboratory test instruments and it can be said that the standard slide switches generally are not rugged enough for the projection room. In case you have not encountered the slide switch, its action is the same as that of a toggle switch, but it is actuated by a button which slides along the panel on which the switch is mounted.

By "key switch" we refer to the telephone type. These are used in many types of speech circuits and there are switches of this type on the market that will handle small amounts of power. The contacts are of the self-cleaning type, it being accomplished by what is known as "follow" of the springs. That is, the making contact continues to move slightly after actual contact is made, thus sliding on the contact which it has made. "Follow" also insures a positive contact that will not chatter and cause intermittent interruptions of the circuit.

Many different contact materials are used, depending upon the application, so in selecting such a switch careful attention should be paid to the type of contacts used. These switches come in many spring combinations so that numerous switching combinations may be ob-

(*Continued on page* 18)

In recognition of the urgency for the continued salvage of every bit of copper, the National Carbon Company has designated on each package the number of ounces of copper that can be saved from the carbons enclosed therein, as shown below:

8mm x 14"	"National"	"Suprex"	Positive	Carbons	3.2	oz.	copper	drippings
8mm x 12"	"	"	"	"	2.7	"	"	"
7mm x 14"	"	"	"	"	1.5	"	"	"
7mm x 12"	"	"	"	"	1.3	"	"	"
7mm x 9"	"National"	"Orotip"	C Negative	Carbons	1.6	"	"	"
6mm x 9"	"	"	" "	"	1.3	"	"	"

Technical Wartime Developments To Highlight SMPE Convention

WARTIME developments in motion picture sound recording and reproduction will be spotlighted at the fifty-fourth semi-annual conference of the Society of Motion Picture Engineers in Hollywood, Calif., October 18 to 22. According to advance reports an excellent attendance is forecast for this meeting, which will be held in the Blossom Room of the Hollywood Roosevelt Hotel.

Herbert Griffin, president of the Society, will preside at the usual get-together luncheon to be held for members, guests and friends on Monday, October 18. The welcoming address will be made by Y. Frank Freeman, president of the Ass'n of Motion Picture Producers, and vice-president in charge of production for Paramount Pictures, Inc. Allen G. Smith, Chief of the Amusement Section, Service Equipment Division, War Production Board, will be the guest luncheon speaker.

The general sessions are slated to be held each afternoon and evening, Monday through Friday, except Wednesday, October 20, when the general session will take place in the morning. Timely papers on a variety of topics will be presented by prominent scientists and motion picture engineers during the five-day conference.

The various committees directly concerned with the success of the meeting and their chairmen are: Reception and Local Arrangements Committee, Emery Huse; Registration and Information, W. C. Kunzman; Publicity, G. R. Giroux; Papers Committee, C. R. Daily; Luncheon and Dinner-Dance Committee, Loren L. Ryder; Hotel and Transportation, A. M. Gundelfinger; Projection Committee, R. H. McCullough; Ladies Reception Committee, Mrs. C. W. Handley.

The semi-annual dinner-dance, which will be strictly informal, will be held Wednesday evening in the Blossom Room of the Roosevelt Hotel.

Appended hereto are abstracts of some of the papers scheduled for the technical conferences:

DUPLICATION OF KODACHROME TRANSPARENCIES FOR BACKGROUND PROJECTION

Earle K. Morgan and Roy M. Peck
Paramount Pictures, Inc.

Duplication of Kodachrome original, with enlargements, reduction and color correction was successfully made using the following method: The original color transparency was placed over one end of a light proof tunnel (in this case the front bellows of a copy camera) with the copy lens at the other end. Two large daylight blue flash bulbs in white reflectors were used. These were placed on either side of the copy camera and directed at a curved, dull, white reflecting surface two feet directly in front of the transparency to be copied. The film used was "Daylight Type" Kodachrome exposed at stops as required by size of duplicates and density of the original.

Tinted filters were used to correct or to obtain certain color effects without any change to exposure.

In cases where lower contrast was desired, a neutral gray mask (a low gamma black and white negative of the original) was placed in contact with the original transparency and the exposure made through both.

CINEMATOGRAPHY GOES TO WAR

Maj. Arthur Birnkrant
First Mot. Pic. Unit, Army Air Force

This paper deals with the science of motion pictures as utilized by our Armed Forces in modern warfare. Principally, this paper concerns itself with the Army Air Forces which, within little more than one year, developed the First Motion Picture Unit at Culver City, Calif., from the former Hal Roach studio. This civilian establishment was taken over lock, stock and barrel and converted into a military installation of foremost importance.

Many of the motion picture innovations developed by the Armed Forces in this war must of a necessity remain secret for the duration. But when the war is over and these improvements are finally divulged to the public, it will be these very innovations that interest you most.

The importance of motion pictures in the overall war effort cannot be over emphasized. In the fields of reconnaissance, news values on the home front and visual aid instructions that are saving American lives and property, cinematography today plays a foremost role.

To correctly understand what the First Motion Picture Unit is doing, we must break its functions into two phases. The first trains combat cameramen who go into the thick of battle to photograph occurrences that are of inestimable value to our High Command. It is their films, too, that you often see in newsreels, labeled "Army Air Forces".

The second phase covers the making of training films. These, too, cannot be underestimated in importance. To our Air Forces such films are as valuable as arms and planes. For through their "auditory and visionary" instruction are saved the lives of hundreds of American airmen and thousands of dollars' worth of American planes.

MAKING FILMS THAT TEACH

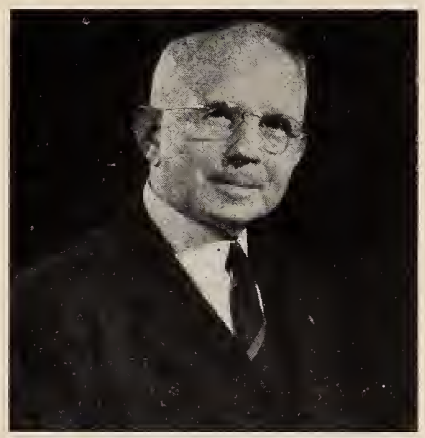
Lt. Reginald Bell
Navy Department

The Training Film Branch is responsible for giving Navy instructors photographic training aids that will help them instruct clearly, accurately, expeditiously, and well. Making such training aids is both a science and an art.

As a science it requires fundamental psychological and educational knowledge as well

(*Continued on page* 22)

P. A. McGuire Appointed Director Of Public Relations for N-S-B



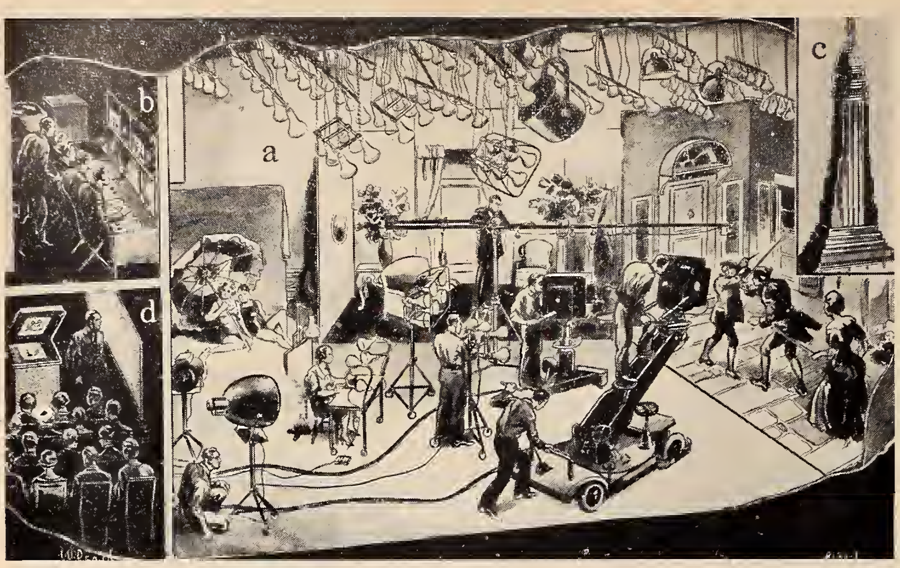
P. A. McGUIRE, advertising manager for the International Projector Corporation during the past twenty-five years, has been advanced to the post of director of public relations for the Projection Equipment Division of National-Simplex-Bludworth, Inc., it was recently announced by A. E. Meyer, manager of the Projection Equipment demonstrations.

McGuire, or "Mac", as he is affectionately known to thousands of projectionists throughout the country, is a well-known figure in the industry, being the originator of the slogan "Better Projection Pays," for which he has ceaselessly campaigned.

"We all realize that the job of advertising manager was a full day's work," stated Mr. Meyer in his announcement, "and in spite of this 'Mac' for a great many years has devoted nights and days to the cause of 'Better Projection' and higher education of the projectionist.

"He has carried on a two-man job in my estimation for too many years, and in recognition for his loyalty to the company and to the industry, a highly deserved promotion has been awarded him, and at the same time he is relieved of the detailed duties of advertising manager. This will enable him to put his full time into following up the work he has so successfully conducted in his so-called spare time; that is, maintaining the friendly contact with the industry and the projectionist.

"It is my sincere belief that permitting 'Mac' to devote all of his energies to this public relation work will prove very valuable to the industry as a whole."



Behind the Television Scenes at NBC: *In the four main phases of television shown here you see (a) the studio in the RCA Bldg. where actors and technicians work under studio lights, (b) the master control room where engineers and directors monitor the sight and sound pickups, whence the electronic impulses speed by cable to the Empire State transmitter, (c) antenna atop the Empire State Bldg. which broadcasts television programs over a 50-mile radius, and (d) combination receiver which reproduces sight and sound transmitted by video and audio carrier waves*

TELEVISION TODAY

1—Electronic Devices

By *JAMES FRANK, Jr.*

THREE of the most important devices which are of great importance in a television system are electronic in nature. In order that the explanation of how a television system works and the description of the modern apparatus used in television be clear and comprehensible, we will consider first the theory of operation of these electronic devices.

All of them, naturally, involve electrons. The electron is the smallest known quantity of negative electricity. All electrons are alike. All matter is made up of electrons. Protons are also found in all matter, the proton being positively charged. Electrons may be removed from the atoms of certain substances more easily than from others.

All negatively-charged bodies repel each other; so, too, do all positively-charged bodies. However, negative and positive eharges attract each other. In other words, there is a constant tendency toward a balance of charge, and since a body is said to be charged negatively only because of the absence of protons, or *vice versa*, it is natural that oppositely-charged bodies should attract one another.

Electrons in motion constitute an electric current. Electrons ordinarily move in any direction, but experiments have proved that electrons are similar to tiny magnets and may, therefore, be guided by magnetic fields.

Electrons may be more easily removed from metals in general, and especially certain metals, than from other substances. Electrons are packed in metals so tightly that it is a fact that adjacent atoms share mutually each other's electrons. Since the electrons flow about freely in the atoms in all directions, it is possible to impress an electrical pressure or voltage upon the metal and cause the electrons to move in a uniformly given direction, thus setting up an electric current in the metal.

Electrons are removed from metals by heat, as in the lamp filament; by light striking certain metals, as in the photo-electric cell; by the impact of projected electrons, and by other methods not important to this discussion.

This is the first of a series of articles on television written exclusively for the readers of I. P. The purpose of these articles is to give the amateur enthusiast of electronics an appreciation of the way both television and facsimile function. In mentioning some of the more important problems that have yet to receive the continued attention of television engineers, an attempt is made to give the reader some idea of the trend television probably will take during the years immediately following the end of the present global war.

So that the reader may have some idea of the scope of the ensuing articles scheduled to be published in this publication during the coming months, the following are but a few of the subjects to be covered: Theory of Television; Iconoscope and the Image Dissector; Television Transmission; Kinescope and Oscillight; Scophony Method of Television; Television Reception; Color Television, and Facsimile

The three devices which are so important in television are the vacuum amplifier tube, the photo-electric cell, and the cathode-ray tube. Each utilizes electrons, but in different ways. Without all three devices television of the modern type would be impossible.

The Vacuum Amplifier Tube

The vacuum amplifier tube is essentially a triode tube. Present-day types have additional electrodes for increased efficiency for certain functions. A triode consists of a vacuum tube with a filament, a grid and a plate located therein. The grid is placed between the other two electrodes. Electrical contacts are provided in the base for each electrode.

The theory of operation of a triode is that when a current is passed through the fine wire filament it causes the filament to get quite hot, thus causing the electrons in the filament to be freed. These electrons then tend to travel in all directions away from the filament. By impressing a relatively high voltage between the filament and the plate, a high positive charge is set up in the plate which strongly attracts the electrons. Thus a beam of electrons is made to flow from the filament to the plate.

The electrons must pass through the grid to reach the plate. If a small voltage be impressed between the filament and the grid, a positive charge is also set up on the grid which increases the attraction to the electron beam and causes it to flow even more quickly and efficiently toward the plate. If, however, the voltage between the filament and grid be reversed, and a negative charge set up on the grid, it will tend to repel the electrons. The flow of electrons from the filament to the plate is thus retarded.

It is thus evident that if an alternating or fluctuating current is passed through the grid, it will cause the grid to vary its charge from positive to negative and back in direct proportion to the fluctuating current. This variation in charge will also cause the electron beam

to be increased and retarded in direct proportion to the fluctuating current.

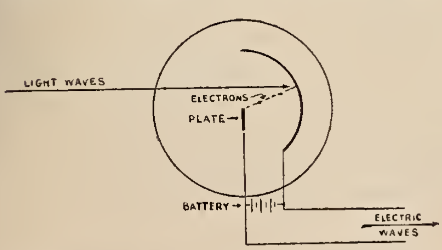
The variation in the speed of the electron beam will vary the current flowing in the plate—to filament circuit. This latter current may be made to be of much greater intensity than the current passed through the grid by impressing a high voltage between the filament and the plate. The electron beam simply increases and decreases this current. Thus the plate current is directly proportional to the grid current in fluctuation and of larger intensity. In this manner, the triode has been made to amplify the current.

A vacuum amplifier tube such as a triode can be made to do several things, depending upon the type of circuit in which it is employed. It can be made to act as a relay, as an amplifier tube, as a rectifier by changing alternating current into direct current, and as an inverter where direct current is changed into alternating current.

A photo-electric cell is a device which changes light waves into directly proportional electric waves (Figure 1). There are certain kinds of metals that emit electrons if exposed to visible light. It has been shown that all metals will emit electrons if exposed to certain types of light, many invisible, but with varying degrees of sensitivity. The metals of the alkalis, lithium, sodium, potassium, rubidium, and caesium are very sensitive to visible light. When light is directed at thin surfaces of these metals, photo-electrons are emitted, the quantity and speed of which depends on the intensity of the light.

Photo-Electric Cell

A photo-electric cell is a vacuum tube in which a cathode, coated with a thin layer of caesium, and an anode is placed. The cathode is generally semi-cylindrical in shape with its caesium coating on the concave surface. The anode is generally placed at the center of the tube and at the radius center of the cathode. A small voltage is impressed between the cathode and the anode so that the anode becomes positively charged and attracts the photo-electrons. Then, as light is directed at the cathode or photo-sensitive surface, photo-electrons are caused to be emitted in proportion to the intensity of the light. These photo-electrons flow in a beam toward the anode and cause a fluctuating electric current in the cathode-to-anode circuit in proportion to the variation in the light intensity. The electric current produced is very small in intensity. The sensitivity of these cells may, in many cases, be very much increased by filling the tube with gas.



Schematic diagram of photo-electric cell

Cathode-Ray Tube

A cathode-ray tube is one in which a stream or beam of electrons is created by a heated cathode or filament. This beam is caused to move with great rapidity along the tube by one or two anodes. The beam may also easily be controlled by both electromagnetic and electrostatic fields so that it can be both focused and deflected. Certain types of cathode-ray tubes may also include a grid similar to that in a triode whereby the electron beam is controlled in intensity by impressing the fluctuating current on the grid.

(TO BE CONTINUED)

A Few Television Facts

Television was on the threshold of commercial introduction just prior to the start of the present world war. Several broadcasting stations were operating on an experimental basis in the New York area and in several other large cities, and a considerable number of home television receivers had been sold in those cities. Large screen television also had been demonstrated a number of times to large audiences in New York City.[1]

The Federal Communications Commission in May, 1940, decided that full commercialization of television should be postponed until it could be decided which of a number of competing standards should be approved. Consequently, the Radio Manufacturers Association set up the National Television System Committee comprising the outstanding television engineers in the country. This group undertook to make a complete detailed study of the problem and offer recommendations to the Federal Communications Commission for a set of standards that would be satisfactory to all.

After making an unusually thorough analysis of the complicated situation, the National Television System Committee, in March, 1941, made its recommendations to the Federal Communications Commission which were later accepted and adopted as standards.[2] By the middle of 1941 when it had been possible to convert most of the broadcasting stations and home receivers to the new standards, the radio industry was already hard at work on government contracts for military apparatus. Shortly thereafter the country was plunged into a global war and the further commercial progress of television had to await victory.

During the wartime period, the various organizations have been busy developing new and improved electronic devices for military purposes. While most of this work is of a secret nature, it is anticipated that when peace comes again much of it will be adapted to commercial systems. However, as far as can be determined now, there have been no new developments of a startling nature which will change the art of television as it was in the spring of 1941.

In particular, the public is warned by leaders of the industry not to be misled by imaginative and extravagant advertising and publicity to expect radio television receivers for the home at prices comparable with those of midget radio sets, or even small combination radio phonographs available just before the war.

[1] Inter. Proj., Jan. 1941, p. 13.
[2] "Television Standards and Practice," by Donald G. Fink.

NAME OF WPB INDUSTRY GROUP IS CHANGED

It was announced in Washington that the name of the Amusement Section of the Service Equipment Division, headed by A. G. Smith, has been changed to the Theatre Equipment Section of the Service Equipment Division, War Production Board. All matters pertaining to the manufacture of 35-mm. motion picture projection equipment, sound systems, accessories and repair parts should be addressed to Room 325, Standard Oil Building, Third and Constitution Avenues. Matters pertaining to the sale and distribution of equipment and repair parts also should be sent to the same address.

Mr. Smith is devoting all of his time to the allocation of controlled materials necessary to manufacture the equipment required by the Army, Navy, Lend-Lease Administration, Office of Economic Warfare, Canadian Division and the Office of Civilian Requirements.

The title of the Amusements Section is retained in the War Production Board, being transferred to the Office of Civilian Requirements, with George MacMurphy as chief. Matters pertaining to the construction of theatres or the reconstruction of burned out theatres should be addressed to his office, Room 2408, Social Security Building. Mr. MacMurphy also will handle correspondence relating to the repairs of a theatre building or the general operating policy of any motion picture or legitimate theatre.

Effect of High-Intensity Arcs Upon 35-mm Film Projection†

By *E. K. CARVER, R. H. TALBOT,* and *H. A. LOOMIS*
EASTMAN KODAK COMPANY

(The first instalment of this article appeared in the September issue)

II

Effect of Negative Drift

It will be of interest now to examine what effect this "negative drift," as it is frequently referred to, has upon the quality of the screen image. In order to demonstrate this, the high-speed camera with a telephoto lens was focused upon a portion of the screen image, as shown in Figure 8. The portion of the screen image encircled in this figure consists of a focusing chart, an enlargement of which appears in Figure 9.

The projector was focused to produce a sharp image upon the screen. As stated before, this required that the lens be focused upon a plane of 0.01 inch toward the lamp from the aperture. The images appeared sharp to an observer a few feet from the screen. There was, of course, some lack of definition due to the extreme magnification. When the 16-mm high-speed pictures were projected, it was seen that for each pull-down cycle the 35-mm screen image was out of focus when it first came into view. It then became sharper and sharper until, after the flicker blade and just prior to the next pull-down, the image was in sharp focus.

A series of four frames taken from this 16-mm high-speed film is shown in Figure 10. As before, the four frames represent different portions of the pull-down cycle. *No. 1* frame was taken immediately after the pull-down; *No. 2* frame immediately before the flicker blade; *No. 3* frame just after the flicker blade, and *No. 4* frame just prior to the next pull-down.

The appearance of the screen image with different focus settings of the projector lens was tested using a set-up as shown in Figure 11. A cord was wound about the focusing knob of the projector lens and attached to an indicator on the screen in such a manner that the exact focal setting of the projector lens appears in the 16-mm pictures of the 35-mm screen image. In operation the projector is started and the image thrown on the screen with the projector lens focused +0.02 inch. The high-speed camera is started and as soon as it has attained maximum speed, focus of the projector lens is gradually changed to a focus of —0.02 inch, the movement being recorded by the indicator on the screen.

With the projector focused on the positive or lens side of the aperture, the image is in sharp focus only immediately after the pull-down, since at this point it is nearest to the plane on which the projector lens is focused. As the film in the aperture drifts away from this original position or toward the negative plane nearer the arc lamp, the film moves beyond the depth of focus of the lens and the image appears out of focus

As the focus of the projector lens is changed to the negative or lamp side of the aperture, the effect is the opposite. Here the image comes into view out of focus and changes steadily to sharp focus.

The reason why the projected images appear sharpest when the projector is focused on the negative plane is not understood definitely. It is stated simply as an observation repeated many times with various films, projectors, and operators. It may be that the film in the aperture is in a state of rapid movement during the first one-half or three-quarters of the pull-down cycle due to this heat expansion effect. It is only after this expansion has taken place that the film remains relatively stationary. Possibly the eye prefers to focus upon the image during that portion of the cycle in which the film is relatively free from motion even though this period represents but a fraction of the entire cycle.

All the film which we have described has been perfectly normal. No in-and-out of focus was observed upon the screen, and excellent projection quality

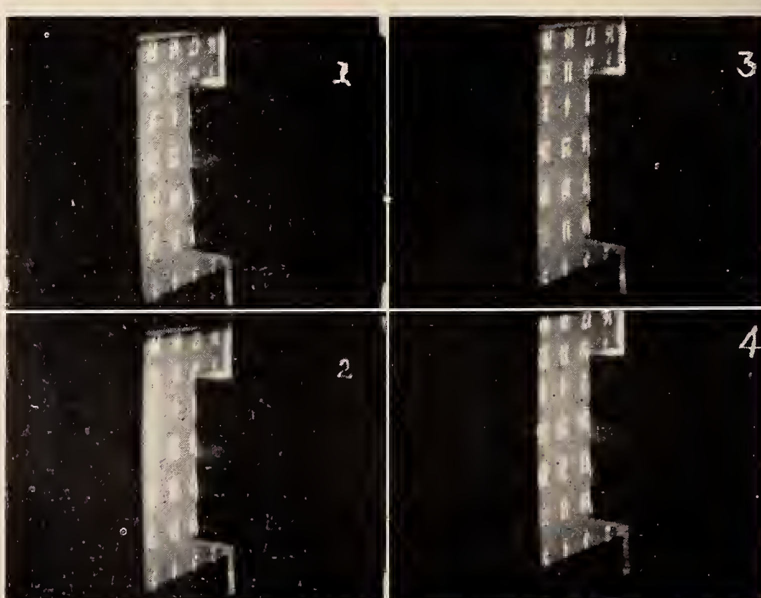


FIGURE 7. *Enlargement of four frames from film shown in Figure 6. (1) Immediately after the pull-down, (2) Immediately before the flicker blade, (3) Just after the flicker blade, (4) Just prior to the next pull-down*

† J. Soc. Mot. Pict. Eng., July, 1943.

FIGURE 8. *Scene used for high-speed screen pictures. The encircled portion is the target*

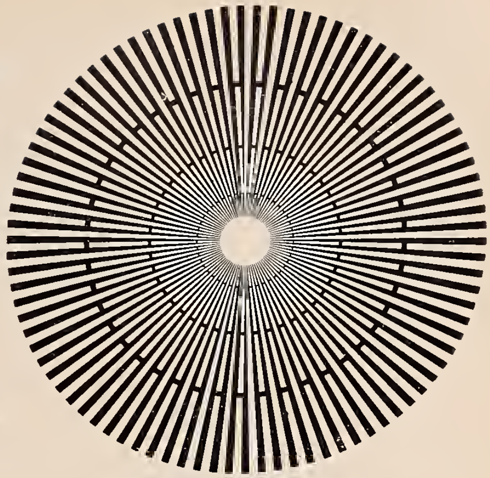


FIGURE 9. *Enlargement of target*

was obtained in spite of the negative drift observed with the high-speed movies. The effect has been obtained with film of all manufacturers and with many types of experimental film. The effect is apparent at all heat intensities above 850° *F* as measured by our thermocouple using the particular print with which we experimented most. In spite of the fact that sharp pictures were obtained even though this negative drift was occurring, nevertheless it was certainly true that the focusing had to be far more carefully done with the high temperature, when the negative drift was large, than with the low temperatures, when it was absent.

"In-and-Out of Focus" Phenomenon

Up to this point the work that has been presented might be regarded as largely of academic interest, its purpose being to contribute to our knowledge of the normal operations of films in 35-mm projectors operating at high heat intensities. However, much trouble of a serious nature has been encountered in the trade with a condition that has come to be known as the "in-and-out of focus" difficulty.

In a number of theatres, particularly *de luxe* houses, it has been impossible at times to keep the image in sharp focus upon the screen. The effect is exactly what the designation "in-and-out of focus" implies; that is to say, the image is perfectly sharp the greater part of the time but occasionally goes out of focus momentarily. Usually the first few projections of prints subject to this difficulty are normal. After four or five projections or thereabouts, and for several succeeding projections, it may become difficult, if not impossible, to keep the picture in sharp focus.

It was some time after this difficulty was encountered before the mechanism by which it took place was discovered. Since it occurred most frequently with high-intensity arc projectors which often emboss the film, many believed that the focusing difficulties were associated with this embossing. However, it is a matter of record that the difficulty may occur in the initial projection of a print on which there is no embossing or distortion of any kind. Likewise this in-and-out of focus difficulty disappears with repeated projections during which time the embossing of the film increases gradually.

Again it was by high-speed analysis of film movements in the aperature that the true cause of the difficulty was discovered. We were able eventually to obtain high-speed pictures of film in the gate of a projector at the exact instant the picture was seen to go out of focus on the screen. The difficulty of obtaining such pictures may be realized by considering that even during bad in-and-out of focus trouble only relatively few frames of an entire roll exhibit the defect and it is impossible to tell beforehand when the trouble is about to occur.

The time required to expose 100 feet of film in a high-speed camera is about 3 seconds, and once the camera is started the entire roll must be run off. Therefore, most of our shots show the action of per-

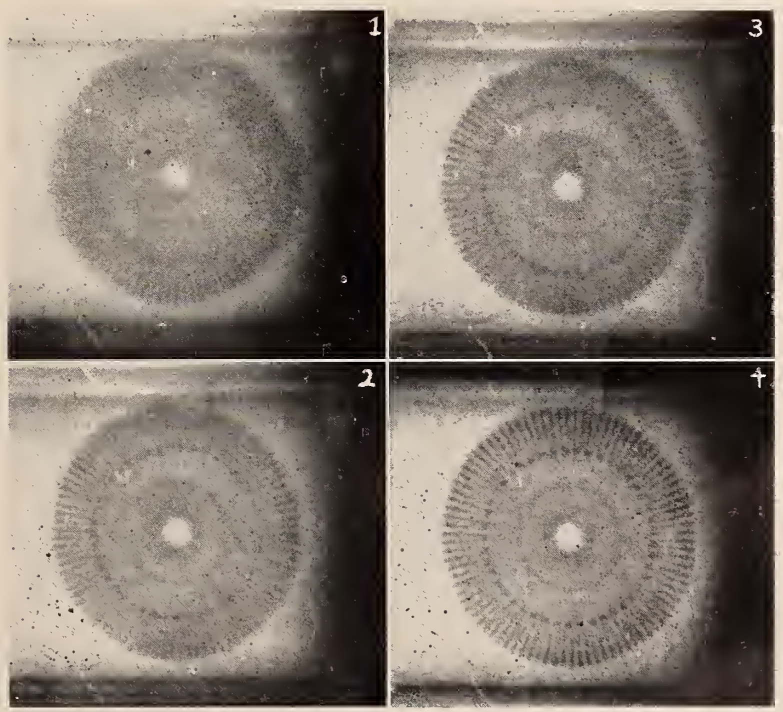


FIGURE 10. *Enlargement of four individual frames from high-speed screen pictures. (1) Immediately after the pull-down, (2) Immediately before the flicker blade, (3) Just after the flicker blade, (4) Just prior to the next pull-down*

fectly normal film. High-speed aperture pictures of film subject to this difficulty show that the great majority of frames behave in a normal manner, *i.e.*, enter the gate in a state of slightly positive curl and expand to a state of negative curl. The projector is, therefore, focused on this negative plane. Suddenly, however, a few frames come into position in the normal manner, start to expand, and then, before reaching the plane of critical focus, jump back again into a state of positive curl. These frames, because of their position at the end of the cycle, are outside the plane of sharp focus of the projector lens, and their images are therefore more or less completely out of focus on the screen.

In order to determine what factors caused certain films to behave in this manner, the variables of processing and projection were studied that were thought to have any bearing on the subject. Of the various processing variables, only one was found to have any influence on the in-and-out of focus effect—the amount of moisture left in the film after drying.

If the film is not dried sufficiently the in-and-out of focus effect is increased greatly. This and other observations have led us to believe that the sudden shift in curl of the frames that appear out of focus is due to a drying-out of the emulsion under the influence of the high heat intensity in the aperture. It is believed that the reason why insufficiently dried films exhibit the in-and-out of focus defect is that (1) there is more moisture in the emulsion, which therefore contracts more on losing this moisture, and (2) the moisture tends to make the film base softer at high temperature, thereby offering less resistance to the pull of the emulsion than if the film base were drier.

These effects, due to insufficient drying, formerly caused some real difficulty with the use of certain fine-grain films. These emulsions reached the point of sensible dryness in the drying cabinet in about one-third the time required for the older type of film. As a consequence some of the laboratories used milder drying conditions for the fine-grain film in order to cause it to dry in the same position in the cabinet as the type previously used. Thus, even though the emulsion appeared dry there was certainly more moisture both in the emulsion layer, and particularly in the support, than in the case of films dried under the older conditions. Upon correcting these drying conditions much of the in-and-out of focus difficulty disappeared.

The various factors in the projection of film that might influence the in-and-out of focus effect on the screen were also studied. These were found to be the characteristics of the lens, the angle of projection, and the heat intensity. In general, the more critical the lens, the more carefully it must be focused. Thus an *f/2.0* coated lens gives a picture of superb quality if the lens is focused with extreme care, but the depth of focus is so small that a slight misadjustment of the lens causes small movements of the film in the aperture to be noticeable on the screen. Likewise a steep angle of projection produces the same effect as decreasing the depth of focus of the lens.

The third factor, the heat intensity, was found to be of great importance. It has been observed many times that films exhibiting the in-and-out of focus effect upon the screen at heat intensities of 1700°*F* would project satisfactorily if the heat intensities were reduced to 1250°*F*. High heat intensities cause the expansion and contraction forces operating on the emulsion to be more violent in nature and, at the same time, soften the film base so that it is less able to withstand them.

One obvious method of reducing the heat intensities of these high-intensity lamps is to insert a heat-absorbing filter between the lamp and the projector. Figure 12 shows the reduction of heat and light effected by this procedure. The abscissa values correspond to the various positions of the condenser lens. The low numbers refer to a position close to the arc, thus giving a large spot and consequently low heat intensity and light values. At the point of maximum heat and light or at a condenser setting of about *No. 6*, the insertion of the heat-absorbing filter has effected a 23.5 per cent reduction in heat intensity with a reduction of but 14 per cent in light at the center of the screen.

As a result of this work, we feel justified in making two recommendations to the trade: one concerning heat intensities and the other dealing with the drying of film. It is recommended that the heat intensity at the aperture of a projector be kept down to approximately 1250°*F* by the use of heat-absorbing glass[1] or other means. It is recommended also that processing laboratories dry their films more thoroughly, taking into considera-

(*Continued on page* 19)

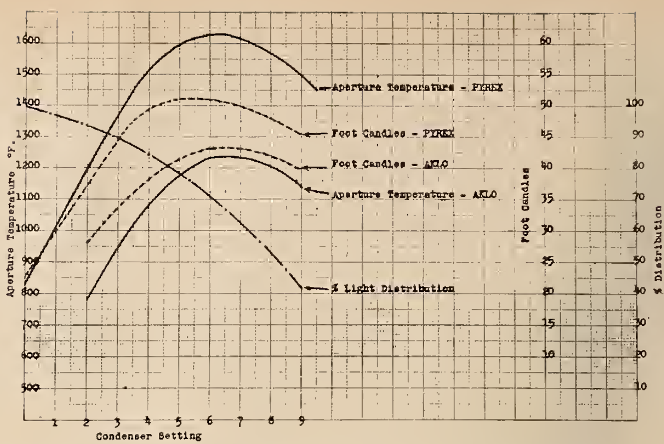


FIGURE 12. *Effect of Aklo heat-absorbing filter on the heat intensity at the aperture of a 35-mm projector and on the light intensity at the screen. The "aperture temperatures" are the temperatures reached by the thermocouples when placed at the center of the aperture. The per cent light distribution indicates the ratio of the illumination at a point 5 per cent of the screen width from the edge of the screen to the illumination at the center of the screen*

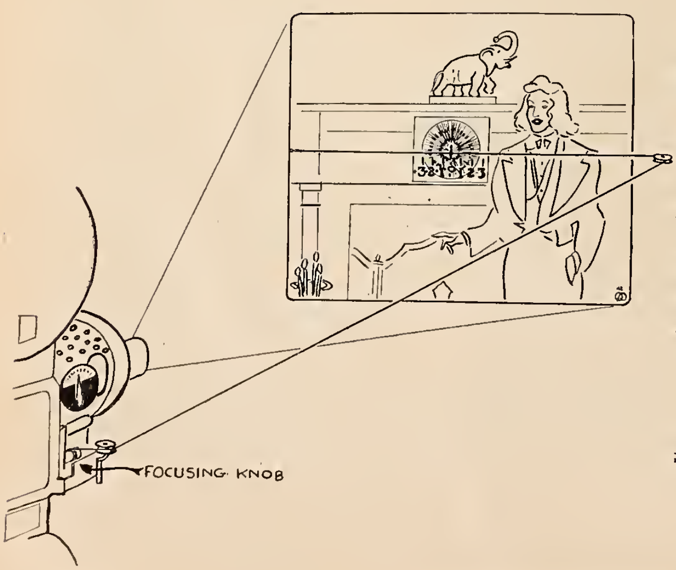


FIGURE 11. *Set-up for recording the setting of the 35-mm projector lens on the high-speed pictures of the screen image*

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Measuring Impedance of Load

When a number of matching transformers are connected to a speaker line on sound installations, it is sometimes desirable to check the actual impedance of the loaded line to see if the transformers and speaker units are correctly connected to the line. Assuming the load has a resistive characteristic with nearly unity power factor, the following simple test can be made:

Connect a beat frequency oscillator, or other source of sinusoidal voltage, to the input terminals of the amplifier which is to supply the speaker line. Knowing the estimated or calculated impedance of the line, connect it to the proper output impedance taps of the amplifier through a series resistor whose value is near that of the line under test. This resistor should have a known value in ohms.

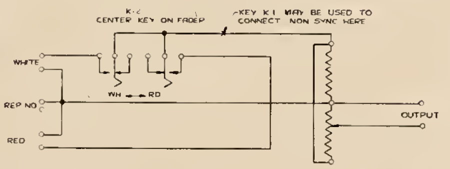
Pass a signal from the oscillator through the amplifier and build up a voltage across the resistor in series with the line to a definite measured value. Then knowing the value of the resistor and the voltage across it, we learn the resistance versus voltage gradient along a series circuit consisting of the test resistor and the line to be measured. Knowing this gradient and measuring the voltage across the line, we can quickly calculate the impedance of the line.

For example, if we have a line which is supposed to have an impedance of 60 ohms and is to be connected to the 60-ohm terminals of an amplifier, to check the line connect a 50-ohm resistor in series with the line across the 60-ohm terminals of the amplifier. Bring the signal from the oscillator through the amplifier up until five volts is measured across the 50-ohm resistor. Then the gradient in the series circuit is 10 ohms per volt and if the line were actually 60 ohms, we should be able to measure six volts drop across it. If we were only able to measure three volts across it, its impedance would be 30 ohms, and we should look for trouble—such as defective speaker units, transformers, or wrong connections.

This test can be made with low power going into the speaker system by using low-test voltages and thereby not disturbing persons working in the vicinity of speakers and lines under test. The range of our average speaker line impedance can be covered with four fixed 10-watt resistors of 10, 50, 100, and 250 ohms resistance which are commercially available.—J. Reibeisen, *RCA.*

W. E. Systems Using the 702-A Fader

If one side of the fader should fail, the other side can be used as a volume control for both machines, the changeover may be made with the Key K-2 by reconnecting to the fader, as shown in the diagram below. The wiring changes are simple, but care must be taken that the ungrounded side of the machine output is connected to the key. The figure below shows the high side of both halves of the fader strapped so that



either side may be used. If one side is open, this strap can be connected, but if it is grounded the strap should be omitted. As shown in the diagram, Key K-1 may be used to connect a non-synchronous attachment.—J. T. Orr and D. P. Clark, *L. U.* 584, *Breckenridge, Texas.*

Improving Phonograph Pickups

As a general rule the use of phonograph pickups for incidental entertainment in theatres is unsatisfactory. This is due to the fact that the usual phonograph pickup has too high an output for this purpose, thereby causing overloading of the first stage of the amplifier and resulting in erratic operation and very poor tone quality. Because of the wide variation in phonograph pickups, no exact rule can be given but the following will give the general idea.

First, it is necessary to reduce the output of the pickup. This can be accomplished by the following procedure: If a volume control is connected across the pickup leads, remove it. Install a 2-megohm, ½-watt resistor in series with the "hot lead" from the pickup, connecting the other end to the high side of the amplifier "phono input."

Connect a 1-megohm, ½-watt resistor from the high side of the "phono input" to the ground side, at the same time connecting the ground side of the pickup direct to the ground input on the amplifier. These connections should be made in such a manner that they can be disconnected when the plug is removed.

It is suggested that the modification be made within the phonograph unit itself. A little experimentation will enable you to get the best results. The resistor values may vary with different pickups. When completed, the amplifier volume control should cover about the same range as that used with sound-on-film reproduction.—C. R. Shepard, *RCA.*

Elimination of Transformer Hum

A very simple expedient to eliminate hum originating in the transformers of arc rectifiers may be effected by painting the core with shellac so that it runs in between the laminations; also shellac between the windings and the core.—H. M. Morrow, *RCA.*

Low-Wattage Bulbs for Cleaning Lamphouses

I find that a 10-watt bulb in the dome of the Brenkert and Peerless lamphouses affords plenty of light for trimming and cleaning, and yet never becomes hot enough to inflict that annoying burn on the back of the hand during the nightly cleaning operation. A bulb of low wattage probably is recommended by the manufacturers of these and other lamps, but I have observed that the practice of projectionists is toward the use of 25- and 40-watt bulbs for this purpose.—Arthur G. Erlich, *L. U.* 233, *Buffalo, N. Y.*

Arc Generator Maintenance

Since generators for motion picture projection are irreplaceable these days, the projectionist could, with a little care, considerably prolong the life of these units. Special attention should be given to the bearings, since overheating may

(*Continued on page* 20)

IN THE SPOTLIGHT

By *HARRY SHERMAN*

HERE is a suggestion to be passed on to the motion picture producers in Hollywood who profess great concern for the increasing number of feature films that are being ruined throughout the country.

The number of theatres still using old and badly worn equipment is amazing. Projection machines, for instance, that should have seen the junk piles many years ago are still in operation. Not only do these badly worn out machines constitute a fire hazard and prevent the projectionist from putting on a first-class show, but what is more important from the producers' point of view is the fact that they ruin thousands of feet of film each week. The loss in film damaged by worn projectors is staggering and yet no move is made by the producers—who eventually foot the bill—to prevent this wholly unnecessary waste of money and material.

It is our idea that if the producers were to get up a pool of say, several hundred thousand dollars, and bought up at a set figure all the old projection equipment now in use, which would at once be delegated to the scrap heap to prevent its falling into the hands of unscrupulous dealers, they would not only enable small theatre owners to bring their projection room equipment up-to-date, but they would save themselves many headaches brought on by the tremendous losses suffered in film damaged and ruined by defective projection room equipment.

● Gordon Beck, projectionist at the Orpheum Theatre in Council Bluffs, Iowa, was recently elected a member of the Iowa State Federation of Labor Executive Board.

● In our opinion the I. A. locals on the west coast are to be congratulated for their excellent judgment in starting negotiations for new contracts in the month of October instead of waiting until December when the existing contracts expire. It is the aim of these I. A. officials to have all matters settled—signed, sealed and delivered—when the old contracts expire so as to avoid unnecessary bickerings brought on by retroactive salary adjustments. Good common sense and good business, say we.

● The U. S. Navy recently commissioned a sub-chaser, USS JEFFREY, in tribute to a very brave lad by that name who won his honors at Pearl Harbor. Ira Jeffrey was a cousin to Lester Isaac, chief of Loew's projection department.

● Clarence Jalas, secretary-treasurer, and John Smith, business agent, of Local No. 110, Chicago, Illinois, informed us when we visited the local offices recently that two cartons of cigarettes are sent each month to all Local 110 members in the armed forces. In addition, members waive all pay on bond drives calling for the services of projectionists—the same holds true for shows given for the OWI.

● Projectionist Local No. 424, Fall River, Mass., was granted a wage increase by the regional War Labor Board.

THANK YOU!

Dear Harry

I am writing at this time to advise you that at our last meeting the organization approved a proposal by Al Johnstone that INTERNATIONAL PROJECTIONIST be adopted as the official journal of our organization, and that the entire membership subscribe to it for a period of two years.

Therefore, I am enclosing herewith a list of our membership so that you may start sending them the magazine as soon as possible. You may handle in any way you choose those Local 293 subscriptions you already have on your mailing lists. At any rate you may bill us for the entire membership at the two-year rate.

With all good wishes and kindest personal regards.

EMILE L. BEAUD,
Sec. Bus. Agt., Local 293.
New Orleans, La.

(Thanks to George H. Sullivan for sending us this bit of news). A $26 weekly increase for each projection room (two-men per shift), retroactive to September 1942 should have eased the pains of last month's installment of the income tax. This is good news and we would like to publish more like it.

● Four locals in the state of New York have been members of the I. A. T. S. E. for over 50 years—Local No. 1, New York City; Local No. 4, Brooklyn; Local No. 9, Syracuse, and Local No. 10, Buffalo.

● Arthur E. Meyer, manager of the projection and equipment section of National-Simplex-Bludworth, Inc., a subsidiary of International Projector Corp., is now making an extended tour of the country and plans to visit I. A. locals in Chicago, Milwaukee, Minneapolis, Seattle, San Francisco, Los Angeles, Dallas, and Oklahoma City. Meyer, who has been associated with IPC for about 25 years, has always maintained friendly relations with I. A. locals, and we feel certain that these locals will extend to him a welcome hand.

● A visit to the projection room of the Paramount Theatre in New York City seems to be a "must" with servicemen holding membership cards in the I. A., and who spend their furloughs in this city. J. W. Toler, member of Local No. 762, San Luis Obispo, Calif., was our latest visitor. He was admitted to the projection room at three o'clock in the afternoon and remained there until the theatre closed—two o'clock the following morning.

Being a likeable youngster (he seemed such a kid in comparison with the a.k.'s there) Toler was immediately "adopted" by the night crew. He was given excellent pointers on projection, spots, floods, effects, etc., and seemed to get quite a kick out of watching the operation of the various machines.

Toler is a projectionist with the Army and is now attached to the Air Corps

Army Relief Show personnel. He gave us some interesting data on the status of a soldier projectionist. We learned that a chief projectionist in the army receives extra pay of $1.75 for each show, while the assistant projectionist receives $1.25 per show. After putting in a full day marching and training, the soldier projectionist has just enough time to grab a sandwich and a cup of coffee before rushing off to the projection room in time to clean up the projectors preparatory to the running of the evening show. Matinees are held only on Sundays, and for these shows the chief receives 75c and the assistant 50c. All film is rewound by hand, for army regulations prohibit the use of automatic rewinders.

There are rumors that the WACS will no longer be permitted to run the 35-mm projectors. (It has always been our contention that women are emotionally unfitted for this type of work, and it seems that the Army is just beginning to realize this.)

Toler asked us to send his regards to the members of Local No. 762 and to all his friends in the San Bernardino Local No. 577. All in all, it was swell knowing this kid and we greatly enjoyed being his host for the evening.

● Clarence D. Shandy. Local No. 401. Centralia, Wash., has been reported as missing in action somewhere in the Mediterranean area. Although Shandy, who was married and the father of two children, was well over the draft age and held an essential war job in a Portland, Oregon shipyard, he preferred taking a more active part in this global war. To his survivors we offer our deepest sympathy.

● Many I. A. members throughout the country are lending their efforts in helping to win this war by taking active parts in the many drives on the home front. They work quietly and without any fanfare, and the recognition they deserve is not always given them. Therefore, when one of our members is commended by the director of a campaign in which he volunteered his services, we are very happy to publicize the facts in these columns.

We refer specifically to Morris J. Rotker, member of Local No. 306, New York City, who was mentioned in a report issued by Frank D. March, New York City Salvage Director. We shall quote from Mr. March's report, to wit:

"Salvage is much more than a program of newspaper stories and radio announcements. Its success is measured by the personal efforts of salvage workers who give their time and labor to keep the wheels turning. . . . We know of many outstanding volunteers. One about whom we should like to tell you is Mr. Morris J. Rotker, Salvage Director of the Fleetwood CDVO Branch of the Bronx, who, among other things, has personally picked up and delivered to a salvage depot over 8,000 lbs. of silk and nylon stockings. So far as we know this is a record for any individual to date. Mr. Rotker has never been in the junk business, but he knows he is aiding his two sons and son-in-law now in the armed forces. In addition, he has also investigated 150 jalopy leads and succeeded in having over 60 of them scrapped."

● B. I. Steinmetz, president of Local No. 213, Great Falls, Mont., has been re-elected president of the Great Falls Central Labor Union, an office he has held for many years.

● William F. Canavan, former I. A. president, and Mrs. Canavan, paid a flying visit to New York on their way to Washington, D. C., to visit their newest grandchild, a son

● We regretfully announce the death of Frank H. Richardson, known to projectionists all over the country as "Pop" Richardson. "Rich" had been in poor health for the past few years and with his passing the industry has lost one of its most colorful figures. Although we seldom agreed with his political activities, we admired him for his fighting qualities.

● The Little Steel formula calls for a 15% increase in wages where there has been none since 1941. The War Labor Board in Chicago evidently is not familiar with this ruling or else they choose to disregard it completely. Local No. 110, Chicago, Ill., requested a 5% increase for its members and was turned down by the regional board. Strictly speaking, Local 110 is not asking for an increase but is merely asking the exhibitors to return to them part of the salary cuts they have taken over a period of years.

So-called "summer" cuts were granted to the Chicago exhibitors upon their pleas of poverty caused by seasonal reduction of box-office receipts. With the upturn of business, solemnly promised these wily exhibitors, the cuts would be restored in full to the considerate projectionists. Well, for the projectionists of Chicago this "upturn" is still around the corner, despite the glowing accounts published in the press of the tremendous "take" at the box-offices of motion picture theatres.

● The denial of a 5% wage increase to Stage Hands Local No. 2, Chicago, Ill., by the regional War Labor Board was appealed to the National Labor Board in Washington, who ruled in favor of the stage hands.

● A salary increase from $75 to $95 per week for stage hands traveling with USO shows has been approved by the War Labor Board. The stage managers of these shows also were granted a hike in pay from $85 to $100 per week. Both increases are retroactive to May 1, 1943.

● According to a statement issued by the Safety Research Institute, an average of 1200 to 1500 theatre fires were reported for each of the past five years. Of this number 44% of the fires originated in *projection rooms* — a pretty high percentage. Please note that the aforementioned figures cover *reported* fires only; there are many fires in projection rooms that are not reported but are put out by the projectionists themselves before they have a chance to spread.

It occurred to us that if a solid wall were built between projectors, a fire in one projector would be confined to its partitioned space, and would be prevented from spreading to another part

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I. P.'s Harry Sherman (center) calls on P. A. McGuire (left), director of public relations for N-S-B, and Arthur E. Meyer, manager of N-S-B's projection and equipment section

SWITCHES

(*Continued from page 8*)

tained. The springs are adjustable as to "follow" and therefore the sequence of operation of the various springs. A certain amount of maintenance is required in that the contacts must be kept clean in spite of the self-cleaning feature; they must not be allowed to become pitted, otherwise noise and possibly circuit interruptions result.

Still another type is the point switch, used as a fader in some of the early sound systems and for other similar applications. Here we have a detented switch with a swinger and a number of contact points usually on the circumference of a circle. These switches become noisy if the swinger and points are not kept clean and the tension on the contacts is not maintained. Frequent inspection and cleaning are necessary. Later switches of this type use silver, and so overcome some of these difficulties.

Mercury Switches

The recently introduced mercury switch is a definite advance in switch design. It is sealed so that moisture, dust and grit cannot lodge on the contacts, and since all connections to the switch can be soldered a circuit of excellent properties can be obtained. Such switches are of the tilting type, the mercury in the enclosure flowing to surround the contacts to be connected. These switches are known as the dry and wet contact types. In the former the mercury actually moves to enclose the contacts. This type is used for power work where the contact resistance is not of great importance, for this value changes within rather wide limits. In the latter type a globule of mercury always surrounds the contacts and there is another globule, which moves as the switch is tilted, and so contact is mercury to mercury.

In this form the contact resistance of the switch is extremely low and very constant. It has been applied to a limited degree as a switch in sound circuits and seems to be ideal for this purpose. In the design of a switch mechanism using this type of switch it is necessary that consideration be given to vibration conditions so that the switch will not interrupt the circuit intermittently. There is no maintenance on this type of switch and the contact resistance remains constant over the life of the switch if it is not overloaded. Switch life is exceptionally long, usually terminated in those glass enclosed switches only by breakage of the glass envelope.

As you go over the switches in your sound system you may find that few if

any of them meet the requirements laid down in this discussion. Such being the case, keep a watchful eye on such units and do not let them reach the point where they will cause a break in the show. Keep adequate tension on all spring contacts. Do not, however, carry this to the point where the contacts actually are gouged by the moving blade, or the switch will not operate in the manner intended. Be sure that there are no rough surfaces or edges on the blades or contacts that will roughen the other. At the first sign of burning, discoloration or pitting, burnish with crocus cloth. If the condition has reached the point where crocus cloth is not effective use a point file judiciously.

We want to insert another word of caution about the use of lubricants on switch contacts. First, if absolutely necessary, a light grease—vaseline is good—may be used, but very sparingly. Wherever possible it is better to apply it with the finger and wipe off all excess with the finger. In this way a thin coating is applied; there are no globs to pick up and retain dust and grit. If you are unable to protect such switches from dust and grit or to inspect them at frequent intervals it is better to omit the grease and just keep the switches clean.

Just because your system is not equipped with the latest designs in switches is no reason to conclude that all kinds of trouble will be experienced now that you have read of possible difficulties. After all, your system has been in service for some time and you know the types of switch trouble that you have experienced. Watch for these conditions and prevent them from developing. Just now one will be fortunate to obtain any type of replacement switch, let alone acquiring the one best suited for the application.

EFFECT OF H.I. ARCS

(*Continued from page* 14)

tion the fact that the film base must be dried as well as the emulsion. It should be pointed out, however, that under certain conditions overdrying of films may result in "spoky" rolls.[2]

In conclusion, we wish to give full acknowledgement to Mr. Eldon E. Moyer for the time and skill expended in taking these high-speed motion pictures, and to Dr. Alfred C. Robertson and Dr. Geoffrey Broughton for many suggestions contributed to this work.

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1. A piece of Corning Extra Light Shade Aklo heat-absorbing glass 4¼ inches in diameter and 1.2 mm thick was used in place of the Pyrex glass normally found between the lamp house and the mechanism of the E-7 projector. To minimize breakage, the glass was cut into five strips about ⅞ inch wide.
2. "Film Distortions: Their Effect Upon Projection Quality," I. P., August, 1943, p. 12.

AT YOUR SERVICE

(*Continued from page* 15)

result in a breakdown. Hot bearings are caused by insufficient or faulty lubrication, grit or other foreign matter in the bearings, a rough or bent armature shaft. Only the best of lubricants should be used, and where generators use oil rings, the cups should be kept clean and the oil rings observed so as to make certain that they carry oil up to the shaft.

When either dirt or grit causes overheating of a bearing, it can be cleansed with a thin oil or kerosene. If kerosene is used, a good lubricant should be applied immediately after the cleaning.

The bearing cups should be just tight enough to run freely without any side play. Never tighten bearing cups with pliers as sufficient pressure can be exerted with forefinger and thumb. After the cups are tightened, the armature should revolve freely and come to a gradual stop. If it stops quickly, however, the bearings are too tight.

A rough shaft can be caused by grit or dirt, or overheating. If it is not too rough it may be removed with a piece of emery cloth. If the roughness is excessive, it will have to be smoothed down on a lathe with a fine file and emery cloth.

Care should be exercised to keep the generator running as smoothly as possible. All screws and bolts should get a periodic check-up and tightened where necessary. Noise may be caused by the armature hitting pole pieces, brushes grinding commutator, or loose bearings. A grinding or squeaking noise from the brushes can sometimes be stopped by the application of a little vaseline to the commutator. Occasionally a brush will develop a hard spot—this may be eliminated by filing the brush down past this point and then replacing it.—Hal Prosser, *RCA.*

Protecting Reel-End Alarm Roller

Instead of allowing the reel-end alarm roller to bang against the film magazine which, in time, will nick the roller in such a way as to cause it to scratch the film, cement a piece of cork over the spot where the roller hits the magazine.

Where to get the cork? Why, from the tops of those pop bottles that find their way into the projection room. And the cement? Some scrap film with all the emulsion scraped off and dissolved in ordinary film cement to a consistency of thick syrup works swell. Try it!—August Patterson, *Hudson, Ohio.*

Lens Cleaning Tip

I have found that the cotton swabs sold in drug stores under the name of "Q tips" are excellent for cleaning the exterior lens surface of optical systems. They are soft, lintless, and inexpensive.—William H. Reasin, *RCA.*

PLAN TO SIMPLIFY HANDLING OF 35-MM EQUIPMENT

War Production Board officials and manufacturers of 35-mm projection equipment met last month in Washington where a new order restricting disposal of such equipment was discussed. The new order had been under consideration for some weeks previously, with details still undivulged. It is believed, however, that its purpose appears to be to simplify the handling of theatre equipment, which is now controlled in part by several orders, and uncontrolled in some instances.

RCA-EQUIPPED LAND CRUISERS HELP NAVY RECRUITING

Eight Navy Recruiting Cruisers which are equipped with three-way sound reproduction equipment especially designed and produced by the RCA Victor Division of the Radio Corporation of America have proved highly successful in a year's operation. The installation in each cruiser includes four loudspeakers driven by two 15-watt amplifiers, and is adapted for broadcasting phonograph recordings, radio pickups and live talent and speakers at a microphone.

In order to meet power requirements under all conditions each unit is equipped with a gasoline driven generator producing 110-volt a.c. current, with cables to run to standard local power service where outlets are available, and storage batteries for emergency use. Equipped with built-in tables, seats, and other furnishings, the trailers serve as mobile recruiting offices and living quarters for traveling recruiting crews, as well as rally points.

Introducing: Roy M. Brewer

Roy M. Brewer. Born in Cairo, Nebraska, August 9, 1909. Joined the American Labor Movement at the age of 17 while employed as motion picture projectionist at the Capitol Theatre in Grand Island, Nebr. In 1927 became a member of I. A. Local No. 586, Columbus, Nebr., which has jurisdiction over five midwestern towns—Columbus, Norfolk, Hastings, York and Grand Island—the latter being the largest with a population of over 20,000. He is president of Local No. 586, having held that office since 1933, and is also secretary of the I. A. Ninth District. For the past seven years he has served as president of the Nebraska State Federation of Labor.

Brewer was elected to his first office in the State Federation of Labor, the third vice-presidency, in 1928 and served in that capacity until 1933 when he was elected president. Shortly after his election as president, at the age of 23, he was appointed to the Labor Compliance Office of the NRA, having charge of the enforcement of the Labor Provisions of the NRA Codes for the state of Nebraska. He remained with the NRA until that office closed, the latter part of 1935, and then resumed his work as motion picture projectionist.

During the intervening years, Brewer was instrumental in organizing the Grand Island Central Labor Union, serving as president and secretary at various times. Upon his return to the craft he once again became active in the labor movement, and in 1936 was defeated for the office of president of the State Federation of Labor by only one vote. The following year, however, he was unanimously elected to the presidency and has kept that office to date without any opposition.

Under Brewer's leadership, the Nebraska State Federation of Labor with a membership of 30.000 has become an effective force. In each of the major communities of that state there functions a Central Body, and practically every industrial plant of any consequence in the state of Nebraska operates today under union agreements.

As president of the State Federation of Labor, Brewer also served on many boards and committees, among them being the State Advisory Defense Committee; the Regional Committee of the War Manpower Commission; panel member of the War Labor Board; member of the Executive Committee of the United War Relief, and vice-chairman of the War Savings Committee. He recently accepted a position as chief of the Industrial Health and Safety Service, a branch of the Office of Labor Production of the War Production Board. In order to devote his full time to his new appointment, which will require his continued presence in Washington for the duration of the war, Brewer had to take a leave of absence from his duties as president of the State Federation of Labor.

Roy Brewer is married and the father of two children. His hobbies are photography, travel (at present curtailed by wartime conditions) and golf.

SMPE CONVENTION

(*Continued from page 9*)

as the photographic "know how". It demands analysis of the subject matter to be taught, the situation in which it is to be taught, the men who are to learn, and the ways in which they can be taught. As an art it requires a synthesis of photographic techniques, expertness with words, teaching skills, and showmanship.

Out of analysis of the training situation comes definition of the film's specific purpose; determination of the idea and vocabulary level of the film; decision as to the teachable and usable unit of breakdown of the film subject; and choice of the film medium and of photographic and script approach and method. From then on, during all phases of production, the staff's responsibility is to see that narration, photography, animation, and effects all contribute to fulfilling the teaching purpose of the film.

ACOUSTIC LABORATORY IN THE NEW RCA LABORATORIES

Harry F. Olson
RCA Laboratories

Modern facilities for development and research in all branches of acoustics are provided in the new RCA Laboratories. The new Acoustic Laboratories include the following: a free field sound room, a large sound stage, a standard living room, a soundproof room for life tests, dust-free rooms, magnetizing facilities, a live room, a field laboratory and towers, and conventional communication laboratories.

The free field sound room is designed to combine acoustical conditions as obtained in free space outdoors with ideal and normal test conditions. The large sound stage is designed for tests of sound pick-up in standard conventional settings. By a change in "acoustics" the sound stage may be converted into a small theater for sound reproduction tests.

The living room laboratory is designed to be the acoustical equal of the ideal living room in which sound instruments such as radios and phonographs may be developed and tested for normal home use. The soundproof room is provided with special walls and doors for testing loudspeakers at high levels without annoyance to adjoining rooms. The dust-free rooms are used for assembling magnetic structures. The live room is designed for testing of sound absorbing materials.

The conventional laboratory bays include all types of measuring equipment: oscillators, amplifiers, recorders, bridges, etc. Multiple audio-frequency lines are provided so that laboratories may be interconnected. A remotely located field laboratory is used for conducting free field response, power and life tests.

PRELIMINARY HARDENER FOR HIGH TEMPERATURE PROCESSING

H. Miller, J. Crabtree and H. Russell
Eastman Kodak Company

Satisfactory processing of ordinary photographic emulsions in conventional developers is made possible at temperatures up to 110°F. or higher by the use of a preliminary hardening solution, Kodak SH-5, which contains formaldehyde to insolubilize the gelatin, sodium sulfate to retard swelling, and an antifoggant, 6-nitrobenzimidazole nitrate, to eliminate formalin fog and reduce the effective activity of the developer. With proper adjustment of the antifoggant concentration the loss in emulsion speed incurred with orthodox developers is negligible.

The fog is comparable to that obtained when developing to an equal contrast at 68°F. without preliminary hardening. The keeping properties are satisfactory for at least one full working day and the exhaustion life is about fifty 8x10's per gallon without serious change in hardening properties. Deterioration due to storage or use may be corrected by proper replenishment.

IMPROVEMENTS IN DISNEY SCORING STAGE

C. O. Slyfield
Walt Disney Productions

The present Disney Scoring Stage was placed in service in October, 1939. The construction of the stage was rushed for the purpose of recording the musical score for "Pinocchio". At the time this scoring was done the stage had not been completed as originally planned, but was far enough along so that it was considered satisfactory for the purpose and was definitely an improvement over our Hyperion Avenue scoring stage. The results obtained on this recording were quite satisfactory and seemed to justify the delaying of any further work until such time as we had accumulated more experience on the characteristics of this particular stage.

Subsequent scoring, however, made it apparent that the low frequency reverberation

time was too great, with the result that orchestras, especially small orchestras, were hard to balance. With this problem before us, we decided to treat the so-called "dead end" of the stage as originally planned.

This treatment consisted of the following: one by one inch strips of wood placed over the rock wool lining and muslin stretched over and nailed to these strips to form a diaphragm. The muslin was given a light coat of paint which added to its high frequency reflecting properties. At the same time, the diaphragm effect of the muslin aided in the dissipation of the low frequencies about which we were concerned. This treatment was also carried out on alternate upright curved sections on the sides of the orchestra shell itself. These changes have made a decided improvement in the low frequency reverberation characteristics of the stage thus simplifying the balancing of orchestras and giving a much more pleasing overall result.

THE FLAT SPIRAL REEL FOR PROCESSING 50-FOOT LENGTHS OF 35-MM FILM

C. E. Ives and C. J. Kunz
Eastman Kodak Company

The flat spiral reel such as is employed for 6 foot lengths of still camera film is among the most compact types of processing equipment. By a combination of chemical treatment and physical handling it has been found possible to dry on the rack thus diminishing the risk of damage in handling the film.

Complete processing units have been built in 30 foot and 50 foot sizes consisting of stainless steel wire welded to flat radials. Other sizes are possible within limits which are discussed. The two mated sides were mounted on a reinforced bakelite hub which provided the bearing for rotation of the reel and terminated in a handle at one side. The stainless steel spirals were built by Nikor Products Co.

Accessory equipment consists of a reel loading and unloading rewind, processing and washing tanks, loose water stripper and drying cabinet.

The intensity of agitation which can be given is limited. Consequently, the development uniformity, while satisfactory for picture work may have some application in small scale motion picture work.

WHAT TO EXPECT OF DIRECT 16-MM

Lloyd Thompson
Calvin Company

Those people who are using direct 16-mm productions for the first time, or those thinking of using the method will naturally have a lot of questions about it. They will want to know what production facilities are available. They will want to know what kind of laboratory services are available. And they will want to know what can be expected of the final product in the field. This paper will attempt to answer what can be expected of direct 16-mm as it is known today.

A 200-MIL PUSH-PULL SOUND RECORDING SYSTEM

L. D. Grignon and J. P. Corcoran
20th Century-Fox Film Corp.

A new truck-mounted recording channel for use in a studio or on location is described. The interesting features include a new 200 mil push-pull modulator, limiting amplifier, together with test and lineup equipment so arranged as to make it possible for relatively inexperienced personnel to operate same without undue supervision.

SIMPLIFIED VARIABLE DENSITY SOUND NEGATIVE DEVELOPER

Paul Zeff and S. J. Twining
Columbia Pictures Corp.

A variable density sound negative developer composed of Metol, borax and sulphite is described. That such a sound negative developer is possible, is shown by a preliminary survey of the literature pertaining to hydroquinone-Metol activity at low pH values.

In a developer so constituted and coupled with an adequate replenisher system, the oxidation factor is practically negligible and results in a stable pH value which in turn permits the elimination of the usual buffering agents. The value of such a developer is that it permits greater simplicity of chemical control and results in some economy.

Sensitometric data obtained from the operation of this developer show a negative H. and D. characteristic of maximum linear latitude and normal printing characteristics. Gamma-density relationship is very stable during continuous negative developing runs, thus making possible the quantity production of sound negatives of uniform density.

● BUY WAR BONDS ●

Aluminum Pins for Stripped Gears

By *SERGEANT MARK S. MOCK*

WAR DEPT. THEATRE, FAIRMONT ARMY AIR FIELD, GENEVA, NEBR.

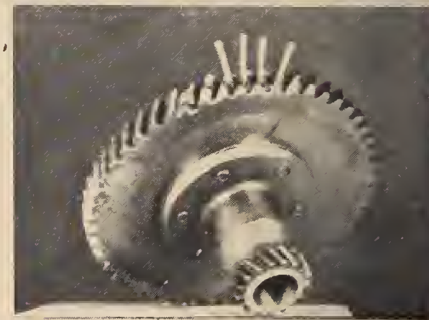
Here we have a concrete example of the practicability of the cures proposed by the participants of I. P.'s recent contest of Skill and Wits. On page 20 of the December, 1942, issue we find that H. D. Taylor, one of the contestants, suggests using pins in building up stripped gears. The author of this article, a member of I. A. Local Union 554, Lebanon, Penna., and a projectionist in civilian life, proves the feasibility of this suggestion

IT WAS the opening night of the War Department Theatre here and the feature picture ("Bataan") had run about 2,000 feet when the right-hand projector "froze" solid. A check-up showed that four teeth of the main drive gear had been completely ripped out, and three others were badly damaged. Naturally, the rest of the picture had to be run on one machine.

The next day I took the damaged gear upon the "line" and had one of the mechanics drive four aluminum teeth into the spaces left vacant by the stripped teeth. (Aluminum is a very soft metal and could not possibly hurt the other gears in the projector.)

For the benefit of I. P. readers who may find themselves in a similar predicament, I shall outline the method of procedure in this particular instance. The aluminum pins were pre-heated to white-hot temperature and burned into place. A small blow-torch may be used to heat the pins to the desired temperature. It is essential at this point to know beforehand just where the pins are to be driven, and to drill the pin-holes just long enough to get them started. The best results may be obtained by using a drill that is a bit smaller than the pins.

The pins were centered, so as to equalize the pull, and were then forced into the vacant spaces. After the protusion of the aluminum pins were checked for conformity with the normal fiber teeth on the gear, pieces of adhesive tape were placed over the tops of the pins and smoothed out into the grooves. Result: A gear that functioned satisfactorily until it was replaced. It was a bit bumpy at first, but the drive soon smoothed it out.



Top photo shows holes drilled in stripped gears before the pins are inserted, and photo in center shows the pins in place ready to be forced into the holes. In the bottom photo the operation is completed and the gear is ready for business

• BUY WAR BONDS •

IN THE SPOTLIGHT

(*Continued from page* 17)

of the projection room. This is an idea that might be passed on to your building and fire inspectors. The money saved in replacing equipment damaged by fire would more than compensate the theatre owner for the slight expense involved in building these partitions—the protection afforded to the projectionist is obvious.

● Harry Mackler, former president and business agent of Local No. 306, New York City, is the proud father of two doctor sons now serving with our armed forces overseas. One of them,

Capt. Saul Mackler

Capt. Saul Mackler, with the Medical Corps, U. S. 5th Army in Italy, was mentioned in a newspaper dispatch the other day for his coolness in treating our wounded while under heavy fire. We knew Dr. Saul when he was a gangling youngster in knee pants—today he is cited for bravery. It makes us feel so ancient.

● Negotiations are now in progress between Local No. 143, St. Louis union officials and the exhibitors for a new wage contract, the old one having expired; meanwhile the members are working on a retroactive basis. Local 143 is asking for a 15% increase and two weeks vacation with pay. We will advise our readers of the result at the proper time.

● An idea of what the future has in store for our craft may be gleaned from an excerpt taken from a letter written by one Private William Nieves, member of the Cafeteria Workers Union. "I am in the Signal Corps," writes Private Nieves, "attached to the Army Air Force. I am going to school to study motion picture operating, and it is something which I might be able to use as a trade in civilian life." Nieves is one of thousands the craft will have to contend with when the war is over. We should like to refer our readers to the article by Thad Barrows, president of Local 182, Boston, Mass., entitled "A Few Post-War Facts," which appears on page 23 of our September 1943 issue. Thad's suggestion, we believe, is an excellent one and should receive consideration by all I. A. local unions.

● George Gerrard, Local No. 348, Vancouver, Canada, is vice-president of the Vancouver Central Labor Union and was a delegate to the Dominion Trades Congress Convention recently held in Quebec City. In conjunction with William Covert, second I. A. vice-president, Gerrard took up the question of the National Film Board of Canada hiring non-union men in the showing of 16-mm pictures in Canada. We hope these men were successful in convincing the National Film Board of the wisdom of placing union men on these jobs.

● In order to complete our files of American Projection Society Bulletins for our own private library copies of the following issues are needed: January, February, July 1927; October, November, 1929; September and October 1930. Would appreciate any or all of these missing issues.

Theatre Equipment Pool Will Be Continued

Allen G. Smith, chief of the War Production Board's Theatre Equipment Section, Service Equipment Division, in speaking before the convention and war conference of the theatre equipment dealers and manufacturers at the Bismark Hotel, Chicago, under the auspices of the Theatre Equipment Dealers Protective Association, said that the theatre equipment pool established in the third quarter of 1943 would be continued through the fourth quarter.

Mr. Smith declared that the Army and Navy still have first call on motion picture theatre equipment, and will continue to have it for the duration of the war.

It was explained that the pool during October, November and December will constitute the same reserve of equipment as now prevails; that is, 100 projectors, 100 lamps, 100 rectifiers and 50 sound systems. Mr. Smith also said that although new theatres cannot benefit from the pool the quarterly outlet will keep the nation's theatres on "the fighting front" to keep up public morale.

The gathering demonstrated the improvement of coordination between manufacturers and distributors, with indications seen of a brightening of the picture insofar as near future supplies are concerned. Ed Weber, of the WPB Controlled Materials Division, said that plans to facilitate the allocation of materials for equipment manufacture have been made and, barring unforeseen developments necessary items will be provided.

Ray Colvin, secretary of the association, was reelected for a two-year term. He declared that the organization's membership rolls are open to all properly qualified equipment dealers in the United States and that the association is independent of any manufacturer or group of manufacturers.

Large Screen Television Perfected by Scophony

As a result of patents issued recently to the Scophony Corporation of America, perfected large screen television for motion picture theatres, homes, schools and churches, both in black-and-white and natural color, will be available commercially soon after hostilities cease, according to Arthur Levey, president of the organization. Scophony is associated with Television Production, Inc., a subsidiary of Paramount Pictures, and the General Precision Equipment Corporation, which in turn is associated with Twentieth Century-Fox Film Corporation.

These basic patents were issued as part of the group of patents covering the Skiatron system, a new television projection apparatus expanding Scophony's basic television methods which is described by Mr. Levey as having characteristic features in common with cinematography by which for the first time it will be possible to project a large screen television picture up to full-sized theatre screens twenty feet in width or more, with brilliance equal to motion picture standards.

"This revolutionary invention which is the work of Dr. A. H. Rosenthal, director of research and development of SCA," Mr. Levey said, "will answer the need of the entertainment world, as well as the home, the church and the school, for high definition television pictures. A theatre projectionist can learn to operate the Scophony projector in a few hours."

Mr. Levey also stated that SCA engineers are now working to make three dimensional television a reality.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933,

Of INTERNATIONAL PROJECTIONIST, published monthly at New York, N. Y., for October 1, 1943.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared R. A. Entracht, who, having been duly sworn according to law, deposes and says that she is the Business Manager of INTERNATIONAL PROJECTIONIST and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are

Publisher, International Projectionist Pub. Co., Inc., 19 West 44 Street, New York 18, N. Y.
Editors, C. F. Alexander and W. L. Lightfoot, 19 West 44 Street, New York 18, N. Y.

Managing Editor, None.

Business Manager, R. A. Entracht, 19 West 44 Street, New York 18, N. Y.

2. That the owner is:

International Projectionist Pub. Co., Inc., 19 West 44 Street, New York 18, N. Y.

R. A. Entracht, 19 West 44 Street, New York 18, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

R. A. Entracht, Business Manager

Sworn to and subscribed before me this 5th day of October, 1943.

(Seal) BERNARD SCHWARZ

Notary Public, New York County Clerk's No. 149, New York County Register's No. 196-S-5.
My commission expires March 30, 1945.

AS YOU NEVER DROVE BEFORE!

Many a soldier owes his life to a commander who drove him to the utmost in battle—*never let him slacken for a single fatal instant!* And after the war, many a worker will owe his economic safety to a leader who drove him continuously for higher Pay-Roll allotments for the purchase of War Bonds!

Despite higher taxes and prices, the average worker still has more money than ever before—particularly on the basis of the *family* income. With others in the family earning, too, just let the worker 'figure it out for himself', and he usually will realize that *now* he can put more into War Bonds than he has been doing.

That's why the Treasury Department has set new quotas for the current Pay-Roll Allotment Drive—*quotas running about 50% above former figures.* These quotas are designed to reach the *new* money that's coming into the family income. Coming from millions of new workers . . . from women who never worked before . . . from millions who never before earned anything like what they are getting today!

The current War Bond effort is built around the *family* unit, and the Treasury Department now urges you to organize your War Bond *thinking*—and your War Bond *selling*—on the basis of your employees' *family* incomes. For details, get in touch with your local War Finance Committee which will supply you with all necessary material for the proper presentation of the new plan to your workers through your labor-management committees.

Today about 30,000,000 wage earners, in 175,000 plants, are buying War Bonds at the rate of nearly half a billion dollars a month. Great as this sum is, *it is not enough!* So turn-to today! Get this new *family income plan working!*

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

YOU'VE DONE YOUR BIT—NOW DO YOUR BEST

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

This Space Is a Contribution to America's All-Out War Effort By

International Projectionist

INTERNATIONAL

PROJECTIONIST

NOVEMBER 1943

VOLUME 18 • NUMBER 11

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America's "Best-run War" gives birth to a New Idea!

THIS has frequently been called "America's best-run war." And it is.

After a shaky start and the first few stunning setbacks, the crescendo of production, the achievements of the military, and the steely determination of the people have been pretty close to miraculous.

In keeping with this "best-run" handling of all war problems, a new idea has been born, *the new National War Fund*. This new idea brings unity to the inescapable *giving of funds*, to the confusing multiplicity of necessary war agencies.

With the world in flames and in tears, the demands on generous American hearts have been infinite. When the fires of London are so thick the fire hoses run dry . . . when a Chinese mother has to watch her baby die for want of a simple drug . . . when Greeks by the hundreds drop dead in the street from starvation . . . when a home-town "war-orphaned" kid hardly through playing with dolls starts playing with fire . . . decent Americans cannot close their eyes or turn their backs.

These mass tragedies, these war-made horrors, stirred kind people to action. Committees were formed to provide aid for the suffering, and of course these committees needed money to carry on their good and vital work.

Now, in order to eliminate confusion, seventeen of these groups have been combined into the *National War Fund*. You give to this one Fund and you have given to *all* these seventeen agencies.

The National War Fund is officially endorsed by the President. It has the backing of the Government as an improvement over the old confusing way of raising money. It permits you to budget your wartime giving more easily. It makes sense.

This unified Fund does not intrude upon the autonomy of any of these agencies. The USO, China Relief, British War Relief and all the others will be left under their present efficient and experienced direction. They *will* be freed from the task of raising money, and have time to devote full time to their good works; and you will *not* have to dig down so often that your pocket becomes frayed at the edges.

The money you give will do good round the world. It will also do good right in your own neighborhood for we have combined the appeal of the National War Fund with that of our local agencies. Part of your contribution will be used for the families of men in the service, for the children of parents in war work, for the social services needed to keep a community at war healthy, safe and efficient.

Give, generously, today. Add up your total gifts . . . *then double it!*

GIVE ONCE FOR ALL THESE

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United Seamen's Service
War Prisoners Aid
Belgian War Relief Society
British War Relief Society
French Relief Fund
Friends of Luxembourg
Greek War Relief Association
Norwegian Relief
Polish War Relief
Queen Wilhelmina Fund
Russian War Relief
United China Relief
United Czechoslovakia Relief
United Yugoslav Relief Fund
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NATIONAL WAR FUND

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You can obtain maximum efficiency and economy from your Victory Carbons by observing the following simple rules.

USE CARBON TRIM RECOMMENDED FOR YOUR PROJECTION EQUIPMENT.
The Victory Carbon trims indicated in the above table were established by comprehensive laboratory and field tests to ascertain the best results obtainable in all types of equipment.

OPERATE CARBONS AT SPECIFIED ARC CURRENT.
Better projection and greater economy are obtained when recommended arc currents are maintained. The maximum allowable arc current is stamped on each Victory Carbon at the left of the trade-mark.

CHECK FEED RATIO CAREFULLY.
Changes of arc current alter the ratio of burning rate between positive and negative carbons. On lamps equipped with adjustable feed and formerly operated above 45 amperes arc current, this ratio should be adjusted to meet the new current conditions.

A bulletin describing operation of the new Victory High Intensity Carbons is available for distribution and will be sent promptly upon request.

SAVE THE COPPER

Most of the copper used for plating copper coated projector carbons drops to the floor of the lamp house when the carbons are burned. Continue to save these copper drippings and turn them over to your supply dealer as designated by our government.

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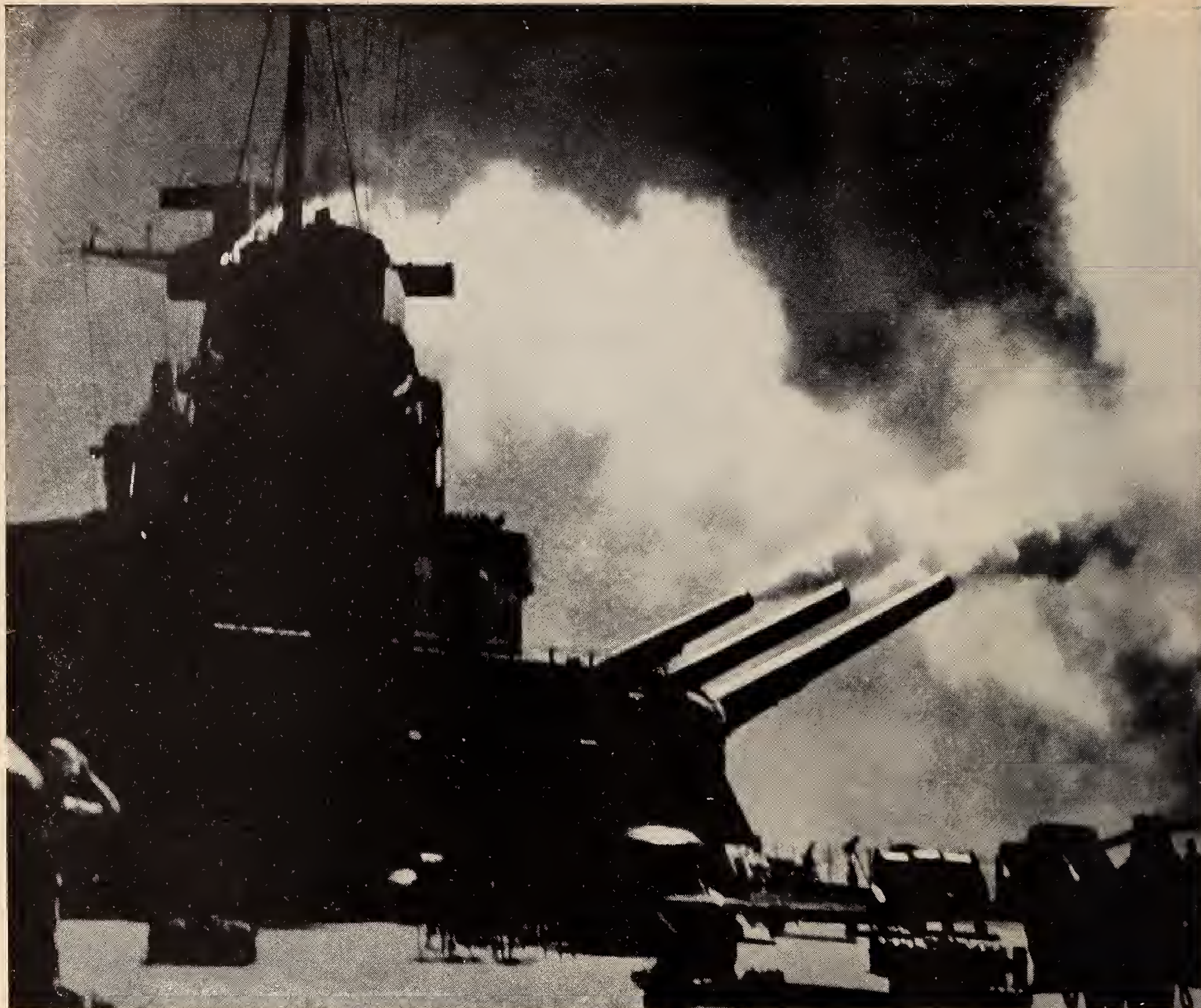

U. S. Navy Official Photo

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

C. F. Alexander, *Technical Editor*
W. L. Lightfoot, *Associate Editor*

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Monthly Chat

DURING 1944, it is believed, required output of radio apparatus will be 35 per cent greater than for 1943—or four billion dollars of equipment as compared with a normal quarter-billion dollars' civilian demand. This huge increase for war radio equipment makes it apparent that no resumption of civilian radio manufacture can be considered during the coming year, barring, of course, an unforeseen turn in the war situation. All civilian output automatically is banned—but WPB is expected to provide tubes and parts to keep at least one radio set working in each of the country's thirty million radio equipped homes.

• • •

Still another use has been found for the photoelectric cell—that of measuring cloud heights. A powerful searchlight is used, operating on 60 cycles a.c. with the lamp projecting its beam exactly vertical. A photoelectric cell is located behind a lens system so that it "sees" only the spot of light on the cloud and, since this light is modulated, signals are emitted by the cell, passed through an amplifier carefully tuned to the modulated signal, and either registered on a meter or recorded. When the photocell is focused on the spot of light on a cloud the angle of the photocell unit will vary with the height of the cloud if the distance between the light source and this unit remains constant. Knowing the base line and the angle, the altitude of the triangle or the height of the cloud quickly can be calculated.

• • •

Electric illumination of the future may be 90 per cent cheaper than current methods, according to the General Electric Company. Such lighting would cost only one-tenth of what it does today and it promises to be much brighter. A 100-watt lamp of today gives five times the light of a lamp of the same wattage in 1913 and at half the cost for current. The fluorescent lamp, our best source of artificial light today, is less than one-quarter efficient. Improvements in its efficiency, which are certain, will mean more and better light.

• • •

Reports of a new device to counteract enemy radio-location apparatus and complicate the detection of Allied Nations' planes indicate its effectiveness. It was discovered by a young technician at a radio location station who was experimenting independently. The upshot was that during the raids on Milan, Turin and Genoa thousands of strips of paper an inch wide and one foot long—black on one side and with a metallic coating on the other—were dropped from RAF planes. The claim is that these strips deflect the micro-waves and beams of radio-location apparatus and baffle operations endeavoring to defect and locate planes.

INTERNATIONAL PROJECTIONIST

VOLUME XVIII NOVEMBER 1943 NUMBER 11

Film and Apparatus for 16-mm Projection

By *AARON NADELL*

An outline is presented herein of the special features of 16-mm film and equipment, with particular emphasis on the differences between them and their 35-counterparts. A flourishing field of activity before the war, 16-mm holds out every promise of vastly increased importance in post-war days. It offers the projectionist new opportunities and is a development not to be ignored.

PROJECTION of 16-mm films for entertainment, which seems likely to become a husky little brother of the industry after this war, involves peculiarities of film and equipment unknown to the 35-mm field. Some of these differences relate to the smaller dimensions of the 16-mm film, while others relate to the difference in the stock, for cellulose acetate is used almost exclusively; and it is not as dangerous and does not call for the same precautions as the nitrate stock used for 35-mm film.

Still other outstanding differences relate to the commercial history of the smaller film, which up to the present has involved great emphasis on portable equipment with the result that many apparatus features reflect the pressure for compactness and light weight, even in systems not designed to be portable.

It will be noted that on 16-mm sound film there is only one row of sprocket holes. The silent 16-mm film had two rows, but one had to be sacrificed to get space enough for a sound track of acceptable width. Correspondingly, 16-mm sound sprockets have teeth on one side only, and intermittent motion also is imparted to the film by pulling at one side only.

Results, however, are surprisingly more satisfactory than could be obtained by applying the same practice to 35-mm stock, largely because everything about 16-mm is smaller and lighter. The reel in the upper magazine weighs less, and less force need be applied by the pull-down sprocket. The length of film held under tension in the gate is shorter, and therefore offers less resistance to the intermittent action. Another factor of importance in this connection is that the stock is less than half the width of theatre film; it is naturally easier to move a narrow film by pulling at one side only than to move a wide film by pulling it the same way.

The speed of operation is 24 frames per second, as with standard film, but the speed of the film is slower, the frames being smaller. Film moves at the rate of 36 feet per minute, instead of the standard rate of 90 feet per minute. There are 40 frames (and 40 sprocket holes) per foot of film; thus the rate of projection is 1440 frames per minute—or, as said, 24 per second. The sprocket holes are placed one at each dividing line.

Because the film moves more slowly, it is possible to get more playing time on a reel of given size. The reels shown in Figure 1, for example, hold enough film for 100 minutes—the equivalent of a full-length feature picture. With such equipment, it would be possible to rethread while curtains are closing and reopening, and thus run an entire show with only one projector and no change-overs.

Figure 1 also dramatically illustrates some of the precautions that are *not* taken with 16-mm film. There are no magazines, for example. The mechanism is uncased, a practice abandoned many years ago as too dangerous for nitrate stock. Fire-proof film cabinets and special shipping precautions can be omitted. Acetate compounds burn—this film can be set afire. But whereas nitrate compounds, when burned, release oxygen to prolong and intensify their own combustion, acetates do not do this, but tend if anything to release carbon dioxide which retards combustion. The nitrate stock, however, has other and different advantages over acetate, which have always prevented acetate coming into widespread use for 35-mm projection, where the utmost in quality of results is the first consideration.

A 16-mm projection gate is shown in Figure 2. The upper sprocket, with teeth at one side only, and the relatively

shorter length of the film guides and tension shoes, are clearly shown. Reference to Figure 2 also brings out another detail about 16-mm film—the soundtrack is on the inside, next to the main frame of the projector, directly contrary to the position the track occupies in standard projection. Photocell and exciting lamp are of course arranged accordingly.

One feature of 16-mm equipment is the common practice of dispensing with a separate soundhead, and building the sound pickup equipment right on to the projector main frame, as a part of one assembly—a practice rare (though not unknown) in 35-mm equipment. Here is one of many ways in which the need for compactness, at first dictated by the pressure for portability, became a standard practice to be followed in practically all equipment whether portable or not. The apparatus of Figure 1 is not portable nor intended to be, but its design incorporates this same feature.

Another outstanding feature in 16-mm equipment is the frequent use of a claw

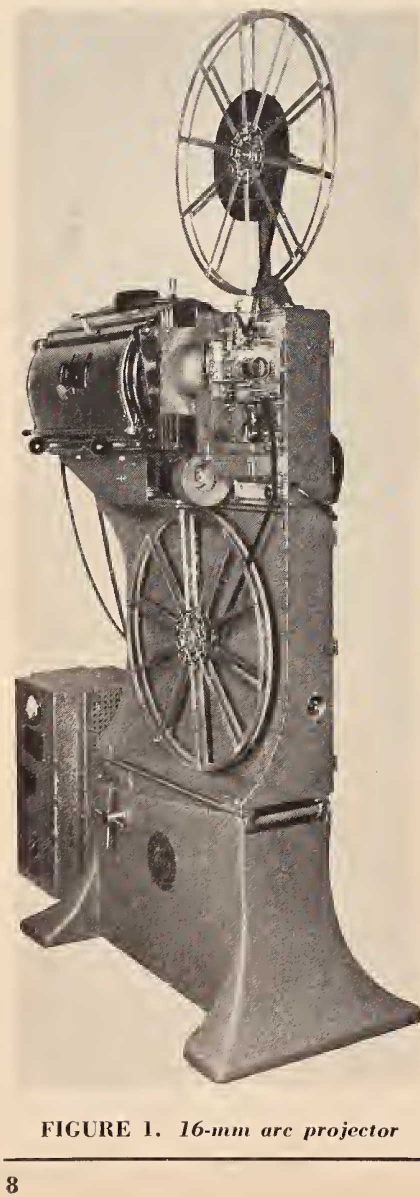


FIGURE 1. *16-mm arc projector*

movement in place of an intermittent sprocket and intermittent movement. Almost everyone has seen this claw on either silent or sound projectors or cameras. From one to three teeth, corresponding to one to three sprocket teeth, project from the claw. By the action of two small cams, which in turn are driven by ordinary shafts, these claws are made to follow a path of motion identical in part with the motion of the teeth of an intermittent sprocket wheel.

Operation of Claw Movement

During part of their cycle of operation the claw-teeth are retracted, not in contact with the film. Then, impelled by their cams, they move toward the film, and the tooth or teeth engage a sprocket hole or sprocket holes. Once in contact with the film, the claw-teeth behave like the teeth of an intermittent sprocket, holding the film motionless over the aperture. Then they disengage, leaving the film free to move. One, two or three sprocket holes may be held in this way, according to the number of teeth projecting from the claw.

This method of effecting intermittent film motion is evidently far less refined than the use of an intermittent sprocket, and many 16-mm equipments use an intermittent sprocket instead. But (here portability again shows its influence) the claw and cams are much lighter in weight, and far smaller, than a sprocket and an intermittent movement. In addition they are very much less expensive to replace.

Less refinement, also, is found in many models in the arrangements for keeping the film motion steady at the point of sound scanning. While a rotating drum, moved only by the film, is used in a number of models, this drum often is linked only to a simple flywheel instead of to the more elaborate double flywheel of standard 35-mm practice.

But 16-mm projectors are likely to have facilities for prefocussing and instant replacement of exciter lamps. One method involves use of a sliding mounting on which two lamps are installed and prefocussed. If one burns out, the mounting is slid over, locking the spare lamp into the operating position.

Drives

Drives are of all known types, with some tendency in favor of V-belts. Geardrives also are used, however, and chaindrive is not unknown. The drive arrangement in almost every case is as simple (and as compact) as the manufacturer can make it.

Motors are of two general types. Considerations of portability have dictated widespread use of universal motors to avoid complications when different types

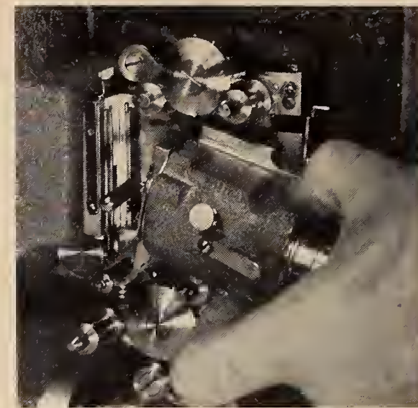


FIGURE 2. *16-mm projection gate*

of power supply are encountered. With such motors, speed is controlled by a governor of conventional design.

The fact that sound came late to 16-mm is evidenced by the common addition, even in recent models, of field rheostats to vary the speed of universal drive motors. Non-portable 16-mm equipments, and some portables sold primarily for use in parts of the country where d.c. is not common, are driven by induction motors.

Takeups vary in design, as they do in 35-mm projectors. One manufacturer uses a driving member with six holes drilled in it; from these holes six studs of 3/8-inch rawhide project under spring tension to make contact with the driven member.

Figure 3 shows a very compact sound amplifier mounted directly in the carrying case of a portable 16-mm sound projector. Not all portable systems carry compactness to this extent; and even in the case of the model of Figure 3 a jack is provided (not visible in the picture) by which the first two stages of the amplifier shown can be used separately as a pre-amplifier feeding more powerful equipment.

For smaller audiences, however, the

(*Continued on page* 11)

FIGURE 3. *16-mm sound amplifier*

Conservation of Copper Oxide Rectifiers

By *S. E. THOMAS* and *E. G. MATHEWSON*

MEMBERS, L. U. 173, TORONTO, CANADA

THE need for careful operation and maintenance of all types of mechanical and electrical equipment becomes more acute with the passing of each day. We all know how difficult it is to obtain replacements for some of the units and that it is impossible to replace others. Copper oxide rectifiers are in the "impossible" class and it is, therefore, of the utmost importance that they be kept in tip-top condition at all times.

We have been using a pair of copper oxide rectifiers in our theatre since May, 1937, and until January of this year these units had failed and the fan motors were overhauled and rewound several times.

As a result of these experiences, we discovered three weak points in this particular rectifier system: (1) Tendency of dirt packing around the cooling fins, thereby cutting off the air supply; (2) unreliable operation of the brush and commutator type fan motor, and (3) the uncertainty of operation of the thermocouple relay which is supposed to open the 550-volt supply to the rectifiers in the event the fan unit fails to function. Knowing the weaknesses of the system, we proceeded to plan a device that would make the units fool-proof, the success of which has been demonstrated to our complete satisfaction.

How Device Was Built

We first secured a blower type pressure fan (Sirocco blade type), with an exhaust opening of 12" x 14", for which we built a metal housing of black iron (galvanized iron was not obtainable), making it as nearly air-tight as possible. From a local air conditioning company we obtained a ¼ h.p. motor, and several steel wool air filters which were sprayed with S. A. E. # 10 oil. The exhaust opening of the fan projected one inch beyond the fan housing so that the ducts conducting the air to the rectifier units could be properly fitted. We then removed the rectifier fan units, thermocouple relays, and the perforated metal bottoms of the rectifier housings.

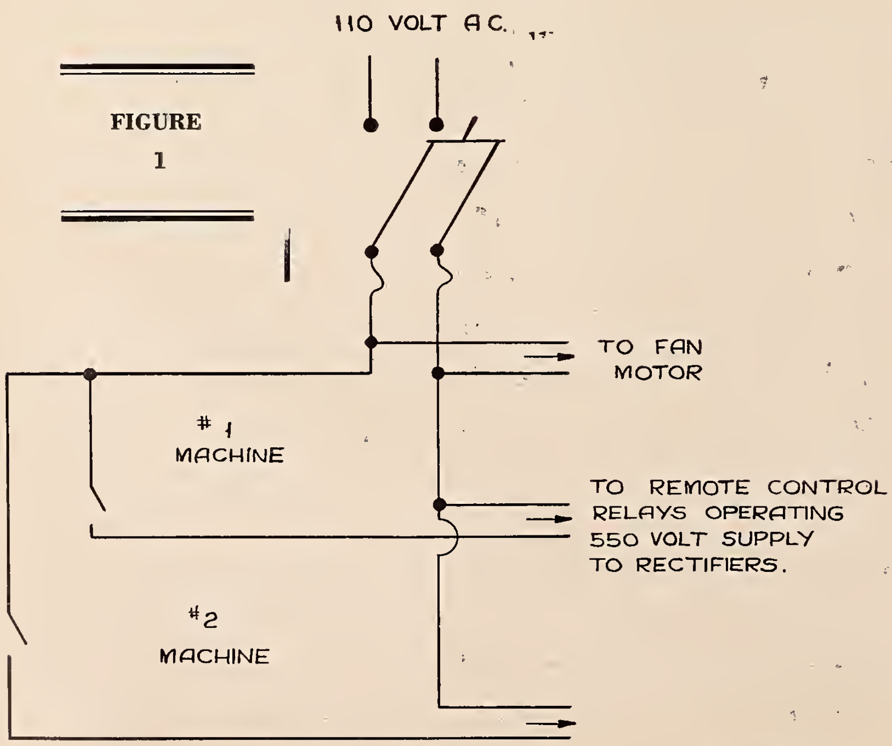
It was necessary to raise the rectifier housings off the floor in order to run the pipes through their bottoms. Being unable to obtain any angle iron (due to priorities) for the construction of a stand upon which to set the rectifiers, we purchased a second-hand steel bed spring from a local second-hand furniture store. The sides and ends of this spring were made of 1½" angle iron which we at once proceeded to remove from the spring. This angle iron was cut into suitable lengths for a stand, and then the pieces were bolted together and welded.

The rectifiers were mounted on the stand and a tinsmith was called in to run a separate duct from the fan to each rectifier, so that each unit would receive the same amount of air. The air filters were fastened into place and so the mechanical part of the installation was completed.

On the electrical end we wired the new fan motor in parallel with the 110-volt supply line to the remote control relays, which in turn control the 550-volt supply to the rectifiers. With the connections so arranged, the rectifiers cannot function unless the fan is in operation. This new fan unit is turned on at the beginning of the show and air is blown through both rectifier units whether or not they are in operation. Figure 1 shows a schematic of this circuit.

This cooling system has been in operation at this theatre on an average of ten hours a day since January 15 of this year, and up to the present time has not given us any trouble whatsoever.

FIGURE 1



Get Ample Air Pressure

Figure 2 shows the installation with the door removed for a better view of the ducts feeding the units. The white band around the ducts is adhesive tape applied to prevent any air leaks at the junction of the ducts and the bottom of the rectifier housings. (Since this photograph was taken, we have added an additional filter unit, thereby increasing the air flow about 10%.)

In planning a unit of this type it is essential that sufficient air pressure be generated so that the corners of the rectifier housings get a good supply of air. Our fan is being run at about 675 r.p.m. Steel wool filters should last from three to six months before it is necessary to replace them. If steel wool filters are not available, mineral wool filters (more expensive) will perform just as well.

We feel confident that this new unit has overcome the three weaknesses of

(*Continued on page* 29)

FILM AND APPARATUS FOR 16-MM PROJECTION

(Continued from page 8)

amplifier of Figure 3 is cabled directly to a portable loudspeaker. In other equipments, a somewhat more powerful amplifier may be mounted in the portable speaker carrying case.

A feature visible in Figure 3 which is also common in the general run of 16-mm systems, is the provision for additional sound input from microphone and phonograph record. Tone controls (one is shown in Figure 3) are standard features, and in some models become slightly elaborate, with separate knobs for low-frequency and high-frequency control. This again is a reflection of the fact that 16-mm grew up in portable operation. Tone controls, and even some elaboration of them, were essential in view of the wide variety of auditorium acoustics which the same portable set must struggle to overcome.

The 750-watt incandescent projection lamp is widely favored for 16-mm work. However, 1,000-watt incandescents are also used, while the model of Figure 1, and some other models, utilize arc lighting. The rectifier for the arc of Figure 1 can be seen just behind the pedestal.

Where there are two 16-mm projectors the prevalence of incandescent lighting has led to incorporation of an extremely simple method of effecting changeover. The projection lamp and the sound exciter lamp are switched simultaneously. Whenever arc lighting is employed, of course, changeover arrangement approximating those of 35-mm come into play.

Exciter Lamp Supply

Some exciter lamps, like those of some standard theatre systems, are a.c.-operated. Some derive their current from rectifiers, as in the better theatre apparatus. A third method, again arising out of the requirements of portability for light weight, utilizes a practice not found in the theatre.

A small amplifying tube, such as type-45, is connected as an oscillator—wired with direct (not reverse) feedback between plate and grid. Such a tube will convert its plate voltage into a.c. at a frequency determined by the amount of capacitance and inductance added to its circuit. A current in the vicinity of ¾ ampere at 4 volts can be obtained, with a frequency above the audible sound range. Applied to lighting the exciter lamp, this current produces no audible ripple in the sound.

The history of 16-mm projection has been such that extreme simplicity of operation was imperative. Among others, schools and churches have been users whose requirements were very important considerations to any manufacturer.

The apparatus had to be, as far as possible, adapted to use by history teachers and geography teachers and Sunday school teachers, many of whom might not know the difference between a vacuum tube and a porcelain insulator. Threading, focussing, in fact every detail of operation, had to be made simple.

In Figure 3, not clearly visible in the reproduction, there is a threading diagram, permanently engraved at the left of the amplifier panel, where the most unskilled user can always refer to it without turning his face from the projector. By the same token, however, the more elaborate schematic and wiring diagrams common to theatre practice are not always furnished—purchasers of the equipment might have not the remotest idea how to read such information.

Maintenance, necessarily, has been simplified also, with a growing tendency toward grouping parts in unit assemblies. (See Figure 2.) If one part goes wrong, the entire assembly containing that part is replaced. Under these circumstances, economic considerations would dictate less refined manufacturing and finishing than is common in theatre equipments—a factor somewhat offset, however, by the faculty with which replacements can be made.

There is no contention that 16-mm film or equipment can deliver results, either in picture or sound, in the same class with those of high quality 35-mm apparatus. But fairly good results can readily be obtained—quality that is acceptable for a wide range of purposes, including good entertainment under certain conditions.

The field of 16-mm sound pictures has been growing and broadening, and will almost certainly receive a strong further impetus through the extensive reliance of the army on such films for training purposes. Numbers of projectionists in the past have found the ownership, rental or servicing of 16-mm equipments a profitable source of additional income, and some have partially abandoned the theatre to devote themselves to a small-film business.

What further opportunities post-war 16-mm will offer the projectionist in business or employment remain to be seen, but additional and important expansion of the field appears to be inevitable.

Motion Picture's Post-War Role

POST-WAR planning today is claiming an increasing share of the attention of industry, government, and the general public, says Nathan D. Golden, chief, Motion Picture Unit, Bureau of Foreign and Domestic Commerce, in the Foreign Commerce Weekly. Motion pictures, in the post-war world, he states, can operate potently as a force of democratization, for humane feeling, for wholesome impulses, no less than for the salutary benefits of recreation. Through the mind and the imagination they can work cogently for good.

After discussing plans of many countries for the post-war period, Mr. Golden states:

"Will the free flow between nations of this powerful 'intangible', the motion picture, be given consideration in the conditions that will surround the framing of the peace? The American industry hopes so.

"It seems virtually certain that the agenda of the peace-making will embrace the endeavor to assure fair conditions and circumstances in other activities such as mining, agriculture, oil, steel, air transport, and various other economic aspects of the modern world. Many students of the situation believe that comparable attention and efforts well may be devoted to the motion picture, which may fairly be said to have proved itself a necessary instrumentality in the successful prosecution of the war, and which promises to be equally significant in the coming era of peace.

"'The motion picture', says the State Department, 'is a recognized instrument of communication capable of presenting clearly to millions, literate or not, the best selling novel of the year, the latest victory on the battlefront, or, by means of animation, it can describe in detail the internal operation of an engine.' Motion pictures, the department stresses, 'are serving a long-range need in identifying the true spirit of the United States through pictures showing our people's daily lives, their work, their institutions, and their land.'

"The endeavor to assure that foreign markets in the post-war period shall be reasonably free of access for our films should be, and is being, recognized today as one of the imperative calls upon the best intelligence of the American motion picture industry.

"It is one phase, but perhaps a dominant phase, in the conscious, wise, and resolute shaping of the pattern of the future—for something that is not only a commercial product but is, at the same time, admittedly a powerful (though intangible) emotional, mental, and spiritual force that can contribute much to wholesome pleasure and reasoned progress in the decades and centuries to come."

TELEVISION TODAY

II—Theory of Television

By *JAMES FRANK, Jr.*

IN ORDER to better appreciate television communication let us first view briefly the simpler form of radio communication. It should be clearly understood, however, that we will not treat with sound radio broadcasting and reception to any great extent. Although sound always will accompany the television picture, it will not in any way differ from the present art of sound radio broadcasting.

The important difference between a radio and a television system is, of course, that the former does not transmit its intelligence or message by wires but, on the contrary, must utilize some means of doing so through space.

The function of the radio transmitter is to excite or affect the medium or space between the transmitter and receiver antennas by means of electric currents which in some way represent the intelligence to be transmitted. The function of the receiver is then to detect these disturbances in space, translate them back into electric currents like the ones at the transmitter, and then convert the currents to the form of intelligence which they represented at the transmitter.

The transmitter consists essentially of three parts: (1) the generator, (2) the modulator, and (3) the antenna. The generator is used to generate or create the particular form of electric currents required. The modulator is the device that controls or governs the generated currents in such a way as to represent the form of intelligence that is to be transmitted. The antenna radiates the modulated currents into space.

The generator in a radio transmitter is similar to that used for creating alternating current for electric light and power, except that the current which it generates is of considerably higher frequency than that used for ordinary purposes. We are accustomed to thinking of electric power in terms of frequency of 60 cycles per second. That means that the current has sixty pulses of flow in each direction per second. The currents that are used in the antenna, however, have a frequency of thousands and millions of cycles per second.

The ordinary radio broadcast frequency band in the United States is from 550,000 cycles per second (550 kilocycles) to 1,600,000 cycles per second (1600 kilocycles). This means that the currents in the antenna of a radio broadcast station flow back and forth from the station generator that many times per second. Incidentally, television uses much higher frequencies, of the order of fifty million cycles per second, and radio laboratories are experimenting with frequencies of more than one billion cycles per second.

Function of Modulator

The modulator is that part of the system which controls the high-frequency alternating currents in the antenna and so modifies them that they represent intelligence. If we are concerned with radio telegraphy, we find that the modulator simply starts and stops the current in short and long bursts representing the dots and dashes of the telegraph code. Therefore, the antenna radiates a series of disturbances through space exactly representing the letters by dots and dashes.

In the case of radio telephony the process is a little more complicated: the high-frequency electric current is fed to the antenna continuously, without ever stopping, but is varied in intensity or strength in accordance with the sounds to be transmitted. To do this a microphone is employed, because it is able to accurately convert the sound waves which strike it into directly proportional electric currents which vary in exact representation of the sounds. The minute currents from the microphone, after being suitably amplified, are then used to control, or modulate, the generated electric currents fed to the antenna by the generator, thus causing the antenna currents to be representative of the originating sounds. To accomplish this the amplified alternating currents created by the microphone are added to and subtracted from the generated currents.

Figure 2 shows the typical connection scheme of a radio telegraph transmitting station. It is evident that no current will flow in the antenna except when the key is closed. By varying the length of time that the key is kept closed, the dots and dashes are transmitted. Figure 3 shows in a similar manner a radio telephone transmitting station. Of course, the microphone is not directly in the antenna circuit in practice but is coupled to it through amplifiers. Here the current may be seen to be flowing continuously in the antenna, being modulated by the microphone. Figure 4 illustrates how an alternating current from a microphone modulates the constant high-frequency antenna current. It may be noted that with the microphone inoperative the antenna current is of conostant intensity, the wave forms being of uniform height. The height of these wave forms is increased and decreased by the microphone current.

Briefly stated, the reception of the radio waves involves the generating of electric currents in the receiving antenna when it is struck by the traveling and varying strength space waves and these currents, after being suitably amplified, are caused to actuate a loudspeaker, which is a device to convert electric waves into directly proportional sound

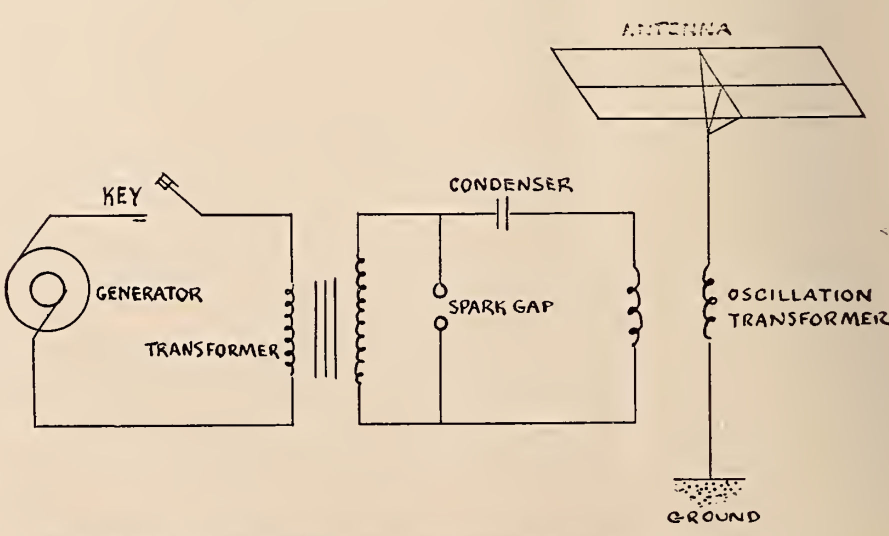


FIGURE 2. *Typical connection scheme of a spark transmitting station*

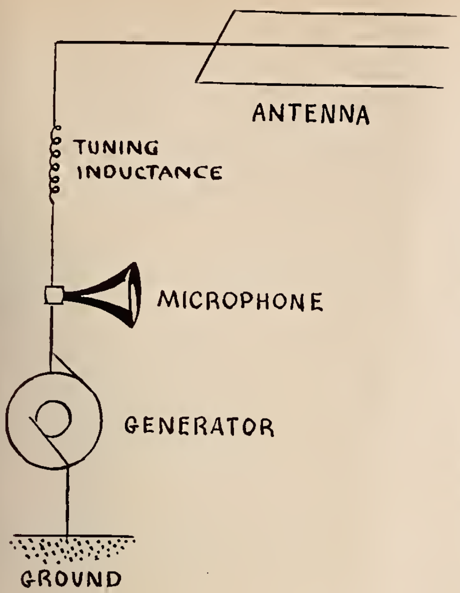


FIGURE 3. ***Typical method of modulating antenna current by voice wave***

waves. Thus, one hears from the loudspeaker the same sound waves that reached the microphone.

Basic Sight-Sound Differences

In both radio telegraphy and telephony we have transmitted intelligence by modulating the flow of an electric current of high frequency in an antenna to represent what we wanted to transmit. This may have been either letter by letter with the dot-dash code, or by sounds occurring in front of the microphone.

In considering television communication it is apparent that the form of intelligence to be transmitted is of a vital nature. Therefore, we must find a way of controlling, or modulating, the high-frequency or radio-frequency current generated to the antenna in some way that can represent the picture to be transmitted. This is where we encounter the basic difference between sight and sound transmission.

In sound broadcasting we have to transmit only one thing, one bit of intelligence, one sound at a time, with others in sequence. Music or speech consist of merely one sound at a time, irrespective of how complex each sound may be. Various tones may compose it, but it is only one sound and it can be represented by only one current. An instant later, another sound can be represented by another current, and we can thus transmit faithfully by radio a progression of single instantaneous sounds.

A picture, however, even on instantaneous flash, is not a single thing of any sort, and certainly cannot be described or represented by one electric current or one anything else. It is composed of many little elements, one for each area of that size which the eye can just distinguish. For example, if we look at a scene the dimensions of which are 10 feet, 120 inches, on each side of a square, from a distance at which the eye can just distinguish objects one inch in diameter, there are nearly fifteen thousand (120 times 120) small, one-inch square areas which must be described individually to convey the whole picture. The description probably will be in terms of light intensity.

If we wanted to transmit a stationary scene, and assuming that the time of transmission was not important, we could do so successfully by an ordinary telegraph system and a simple code. We might divide our scene into the 14.400 squares of one inch each aforementioned areas and number them starting at the upper left corner and moving across each row consecutively from left to right. We could then arrange an understanding or code with our correspondent so that we could transmit to him a message of 14,400 numbers, and that the numbers would be the digits one, two and three—one to mean white, two to mean gray, and three to mean black. Our message then would consist of some combination of these three digits, 14,400 times, such as 111322123333112311l, *et cetera*. Our correspondent then would have to simply rule a sheet of paper with 120 squares each way, and fill in the squares by the information that we have sent him. He would then have the complete picture.

Obviously, the slowness of this procedure makes it highly impractical for transmitting pictures of moving objects. But it is satisfactory, with only moderate change, for the transmission of still pictures, the art of facsimile transmission. The process can be speeded up by transmitting impulses of varying strengths at a constant rate of, say, one per second, to represent the degree of light in each square. The time of transmission is thus reduced to 14,400 seconds or four hours.

The receiver in this case is a printing device to record each impulse in the same order and location which it occupied at the transmitter, and with an ink intensity corresponding to the current intensity of each impulse. The chief problem incident thereto would be the synchronization between the transmitter and the receiver. It would be necessary that the receiver print a mark in square No. 1 when the transmitter is describing the light intensity of square No. 1 and so on coincidentally throughout the picture. Such a facsimile system can be used with either transmission by radio or wire. Commercial systems of this type now in use speed up the number of impulses to several per second and cut down the time of transmission to about ten minutes or less per picture.

Still vs. Moving Transmission

It can thus be seen that the problem of transmitting a still picture segment by segment presents quite a different problem from sound transmission where only one thing, one sound, has to be transmitted. The facsimile art, that of transmitting still pictures, has been so developed that pictures of excellent quality can be transmitted today. Important, however, is the fact that it requires several minutes to transmit one picture.

By contrast, television, the transmission of moving scenes, requires transmission of many pictures each second. Just as in motion pictures, it is necessary to transmit still pictures with sufficient rapidity to make use of "persistence of vision" by which the spectator is given the illusion of a continuously moving scene.[1]

Sound motion pictures are projected at the rate of twenty-four different still pictures per second. To obtain comparable results in television, therefore, it is necessary to find a way to transmit at least two dozen pictures per second, to send out information about each small element of each picture, repeating the process many times each second. Recalling that the transmission of a facsimile picture requires about ten minutes, if it is desired to transmit thirty pictures per second for television, the process has to be speeded up by eighteen thousand times!

There, in a nutshell, we have the primary cause of practically all the television engineering problems. It may be described as a requirement of transmitting an enormous amount of information with great accuracy in a very short space of time. Let us see how this may be accomplished.

Of course, we have only light to start with. Any object or scene is visible be-

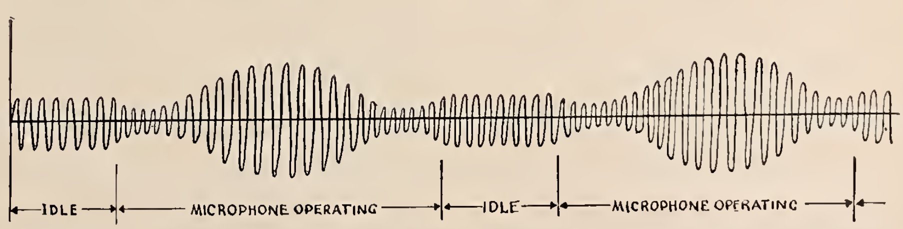


FIGURE 4. ***Antenna current modulated by alternating sine wave from microphone***

cause of the light waves which are reflected from it to the eye. For television we desire to capture these light waves with some kind of device that will convert them into electric waves which can then be used to modulate, or control, the radio currents being fed into the transmitting antenna from a generator. The best way to convert light waves into electric waves is by means of some sort of photo-electric device.

There are two different devices used in television at this time to convert light waves into electric waves. One is known as the *Iconoscope* and the other is the *Image Dissector*. These devices correspond to the microphone in sound transmission. Where the microphone converts sound waves into electricity, these devices convert light waves into electricity.

The Iconoscope

The Iconoscope, described here in detail, is the pick-up device used by Radio Corporation of America in their television system. It utilizes the storage system principle, since the electrons are stored until scanned after each scene has been projected on the plate.

The Iconoscope has two main parts. One is a plate upon which is focused by ordinary optical means the scene to be televised. This plate corresponds exactly to the plate or film in a photographic camera; however, its surface is covered not with a photographic emulsion but with light-responsive elements, or photoelectric cells. These cells are microscopic in size, but each is separate from the others and each generates electric voltage when light strikes it, with the voltage being proportional to the strength of the light.

When a scene or picture is focused on this plate, with various parts of the picture at various degrees of brightness, the tiny photo-electric cells which have no light upon them generate no voltage; those with bright light upon them generate a strong voltage, and those with intermediate light, of course, generate an intermediate voltage. The problem, then, is to simply collect the various voltages off the plate in order to use them.

One method of doing this might be to employ some sort of mechanical system which causes a tiny wire to brush against the plate and sweep with uniform strokes all over it, thus contacting the whole area bit by bit. However, since it is necessary to sweep the entire plate with such great rapidity, and so many times per second, it is impossible to devise any mechanical system light enough to be so moved. So, a brush which has no weight, a beam of electrons, is used for this purpose.

The second main element of the Iconoscope is an arrangement for generating this small beam and directing it so that it falls upon the plate in one tiny spot. Other electric arrangements cause this spot to move all over the plate, in regular fashion, line by line. The greater the number of lines, the more accurately will the picture detail be reproduced. However, the more lines used, the more information has to be transmitted in the same length of time, and this is more difficult. The number of lines chosen, therefore, must be a compromise between the opposing factors of picture quality and apparatus difficulty.

Electron "Searchlight" Beam

The little electron "searchlight" beam, sweeping across the plate with its regular brush strokes, acts just as a wire brush would and collects electricity from the cells on the plate as it passes over them. The electron beam sweeping across the plate contacts with only one little spot of the plate at a time, which incidentally is smaller than a pinhead. After the beam has completed its travel all over the plate, it comes again to the same spot on the plate to collect the voltage there created. In fact, the beam sweeps across the entire plate thirty times per second, collecting electricity wherever there is any present—which means, of course, wherever there is any light.

The electron beam originates in that part of the Iconoscope called the electron gun or cathode. The cathode is the negative electrode or terminal of a circuit. The cathode is covered with certain chemical compounds which give off electrons when heated, and the cathode in the Iconoscope may be heated readily by current, just as is a lamp filament. Therefore, the cathode is a part of the electron beam; and if we connect the cathode and the plate to external apparatus, we can draw off the electricity which the beam collects from the plate having the light image upon it.

The electric currents thus obtained from the image plate by the electron beam are, of course, very small. But they can be amplified to useful intensities, and then we would have currents carrying intelligence representing the light pictures; and these currents can be used to control the transmitter antenna current.

The electron beam has to sweep across about a quarter of a million spots on the picture thirty times per second. Undoubtedly the busiest thing in the world is this electron beam as it scans the picture, flying back and forth at a speed of several miles per second and collecting the current, so to speak, at each tiny spot of its path.

In short, we have a system which is operating to pick up scenes a spot at a time, but covering spots so quickly and the whole scene over and over so many times a second, that if we arrange a reproducing system to act in reverse fashion to that described, and to deliver light images corresponding to the spot currents, our very slow human senses will not follow the details of the process and will perceive only the average total result, which is the completed picture.

Image Dissector

The "image dissector" is the basis of the Farnsworth television system. In this device the picture to be scanned is focused through an ordinary camera lens upon a translucent, photo-sensitive cathode located at one end of a cylindrical glass tube. As the whole scene falls upon this cathode at once, myriad electrons gyrate backwards through the tube toward the anode. (An anode is a positive terminal of a circuit. In this case it is located at the other end of the tube.)

The focusing coils around the outside of the tube straighten the electrons out and move them in orderly, parallel lines, so that they end up raining upon the anode with a distribution of electrons corresponding to the distribution of light intensity upon the cathode. There is a small aperture in the center of the anode which corresponds to the hole in a scanning disk. The scanning is accomplished by causing electric currents to pass through the focusing coils in a way that will displace the electron image at the anode in a regular order and will permit the constantly flowing, variable stream of electrons to flow through the aperture and fall upon another electrode which amplifies their effect. This method is known as the "direct pick-up" scanning system, since the projected image of the scene to be transmitted causes electrons to be emitted and moved in a stream on the anode during the entire scanning period.

(*Continued on page 26*)

Mister Projectionist

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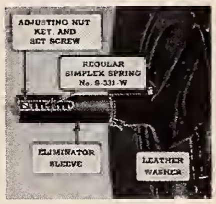

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IN THE SPOTLIGHT

By HARRY SHERMAN

WHAT is happening to one of our FOUR FREEDOMS? Recently, a labor organizer was arrested in the state of Texas for making a speech. He said nothing against our country or our Constitution. He merely addressed a group of workers asking them to join a union, for which he was sentenced to three days in jail and fined $100.

We understand that in Texas it is against the law for a person to organize workers without a state license, although it is not necessary to obtain a license to get members to join a political organization. It seems a bit cock-eyed to us. We are fighting a war. buying bonds and paying taxes so that we may continue with our American way of life. Anti-free speech laws smack too much of Nazism or Fascism—it is utterly foreign to the American concept of democracy. We believe it to be the duty of every I. A. union to help the Texas Federation of Labor in its fight to abolish this undemocratic law, for if it can happen in the state of Texas it can happen in other states.

● James Whitebone, business agent of Local No. 440, St. Johns, N. B., was re-elected president of the New Brunswick Federation of Labor. This is Jim's tenth term.

● According to P. E. Thomas, secretary of the Creston, Iowa, Local No. 592, the WLB approved a new wage agreement calling for a 12% increase *plus* one week's vacation *with pay*, retroactive to November, 1942. The local credits Felix Snow, sixth vice-president of the I. A. with the successful negotiation of this new contract.

● The owner of the Croft Theatre in Bancroft, Iowa, reported that a fire in his projection room was caused by the "film piling up" in the projector. The lone projectionist on duty was unable to check the fire (we think he was lucky to escape with his life).

This is the state where the legislators are extremely lax in their fire laws, and it is a nine days' wonder that most of the theatres there do not burn down. For further information relative to the Iowa state laws governing projection rooms we refer you to I. P., April, 1943, issue, page 14.

● How is this for expansion? We now have I. A. locals in Alaska, Canal Zone and Hawaii. With the rapid strides being made by the Mexican unions, who knows but some day they, too, may become part of our great I. A. Many years ago the theatrical unions in England wished to become affiliated with our organization—a possibility not too remote these days.

● Louis Goldshlag, member of Local No. 650, Westchester, N. Y., convalescing at Saranac Lake, spends most of his spare time booking and projecting films for the other sick theatrical folk. He recently received a bundle of spare parts and his equipment is now in tip-top shape. Hope you will soon be home, Lou.

● Soldiers overseas have been fed a lot of false propaganda about what the workers at home are doing. This is the conclusion reached by Sgt. John Willig, a reporter for the soldiers' overseas newspaper, "Stars and Stripes."

Sgt. Willig recently returned to this country after spending nine months in North Africa, and visited many war plants in an effort to get first-hand information on what the workers on the production front were doing to help in the war effort. He recounted what he found in a radio broadcast, "We, The People." "From what I've seen so far," said Sgt. Willig, "the workers back home are doing a good job. You know, lots of men overseas have an idea our workers are thinking more about overtime than anything else. Well, I've made it my job to talk to many war plant workers, and I've reported to the men overseas it just isn't so." Good boy, sergeant, let's have more like you.

● We are in receipt of a communication from Alonzo Bennett, secretary-treasurer of Local No. 521, Long Beach, Calif., in which he advises us of the heroism of one of his members, Walter Williams, in averting what might have been a catastrophe.

A fire broke out in one of the projectors and Williams, without any regard for his own personal safety, remained at his post in the projection room making every effort to check the fire and prevent panic and loss of life in the theatre audience. In recognition of his action, the district manager of the Fox West Coast Theatres sent the following letter of commendation to Williams:

Dear Walter:

On behalf of our entire organization, may I tender you our sincere appreciation for the very commendable manner in which you combatted the fire which occurred in your booth last Saturday night.

Had it not been for your quick action and determination to stay at your post, we should undoubtedly have suffered a most disastrous conflagration with what possibly might have meant a great loss of life. Our sincere thanks go to you.

Very truly yours,
Stanley Brown, District Manager.

That is all very nice, but suppose Walter had been fatally burned while trying to save the precious equipment—would a letter of praise from the exhibitor have been of much use to him? We are proud to state that Walter Williams did what most I. A. members would have done under similar circumstances—such men are a credit to the Alliance.

● Soon to join the legion of discharged servicemen is Jimmy Webb, member of Local 279, Houston, Texas, and former contender for the light-heavyweight championship of the world. Jimmy will return to his old job and take up where he left off when called by Uncle Sam.

● Emile L. Beaud, secretary and business agent of Local No. 293, New Orleans, La., has succeeded Al Johnstone as chief projectionist for the Paramount-Richards circuit of theatres. Beaud has had a great deal of experience as a practical projectionist and his technical

knowledge should stand him in good stead in his new job. Good luck, Emile, we wish you much success in your new venture.

● It might be a good idea to check with your Social Security Boards to find out if you are being credited with the social security deductions from your pay checks. A certain exhibitor in Florida "forgot" to report these deductions and his employees, although they made regular payments, will not be credited by Uncle Sam for their payments. Incidentally, this exhibitor has been indicted for his lapse of memory.

● We wrote in the September issue of the increase granted to Detroit Local No. 199 members by the regional War Labor Board, which was held up pending a fourteen day appeal to Washington by the minority members of the board who voted against the increase. We are very happy to report to our readers that no action was taken on the appeal and the new salaries went into effect immediately, with each member receiving approximately $130 in retroactive pay. Swell going, and our congratulations to Kennedy, Kinsora, Sullivan, Ruben, and the rest of the executive board members.

● We have enjoyed a bit of correspondence with Rev. Robt. A. Boelcke, M. A., head of the Science Department of St. Mary's College, North East, Penna., an educational institution operated by the Redemptorist Fathers for

Rev. Robert A. Boelcke

the training of boys who are preparing for the priesthood. Rev. Boelcke became interested in projection work in 1916, and since 1929 he has held a Class A projectionist's license in the state of Pennsylvania.

"I began my work as a projectionist way back in 1916," writes Rev. Boelcke, "when I first became acquainted with a Powers, Model 6 machine. The base had a wooden top—what a contrast with the machines of today! Ever since I began my work in this field, I have been most interested in projection mechanics, optics and acoustics. I have made this work my most cherished hobby and that is the reason why I have subscribed to *International Projectionist* for the past number of years, since I realized it would keep me up to date on matters of importance to the projectionist in his work. I never miss reading the magazine from cover to cover, and I thoroughly enjoy every page.

"In training our students for work in the projection room here at the college, I have been most exacting because I have always felt that the nature of the work demanded this attitude. I have always wanted, and try to attain, the highest results in my projection work and I hope I shall always maintain this same high standard.

"At present I am 'operating' two Motiograph De Luxe projectors with the same enthusiasm that I have always had for this most interesting hobby. Of course, you understand my work is restricted to the projection of motion pictures here at the college where I am teaching, but I have always endeavored to visit the projection rooms in some of the larger cities, where I have always been received most cordially. In passing, I might mention that Nicholas Powers gave one of his first experimental projectors to one of the professors of the seminary where I studied. To the best of my knowledge, this machine, which has wooden sprockets, is still in existence."

To Rev. Boelcke we extend a cordial invitation to visit the projection room of the Paramount Theatre in New York City. We shall be very happy to meet him in person, and we speak for the entire crew when we say it will be our pleasure to be his host while visiting the theatre.

● Word was recently received of the untimely death of Mike Ventura, member of Local No. 257, Ottawa, Canada. Mike was only 45 and we find it rather difficult to realize that he has passed on for we remember him as a rather happy-go-lucky individual. Our condolences to his family.

● Eric Vogeler, member of Local No. 486, Hartford, Conn., and now a radio operator in the merchant marine, was a recent visitor to the offices of I. P. Vogeler is happy in his new work, and he has asked us to convey his regards to all the members of Local 486.

● Although Local No. 348, Vancouver, Canada, received a favorable decision from the British Columbia Regional War Labor Board on its request for a two-weeks vacation with pay for its membership, the Famous Players Canadian Corporation has appealed this decision to the National War Labor Board in Ottawa (parent body). This appeal is, of course, holding up the applications covering the other theatres in Local 348 jurisdiction — independent and circuit theatres. The local, however, is determined to fight this appeal and the officers are confident that the decision of the Regional Board will be upheld.

All material presented to the Arbitration and Regional boards during the past four years has been prepared and presented by Local 348 executive board members, without the aid of any lawyers, and up to the present time they have not lost a single case. That's something for the books, we say, and something for which President Pollock and Secretary Leslie might well be proud.

● Local No. 199, Detroit, Michigan, is the purchaser of War Savings Bonds with a maturity value of $68,000.

● It won't be long before Ed Whitford, secretary of Local No. 376, Syracuse, N. Y., will be wearing the khaki of Uncle Sam. Ed has been classified 1A by his draft board and expects to be on his way very soon.

By the way, in Ed's most recent letter he poses a number of questions—maybe some of our readers have the answers. At any rate, here they are and if any of the boys could help Ed out of his latest dilemma it would make a soldier-to-be (maybe a future general, who knows?) very happy. Writes Ed:

"Many years ago I read in one of the trade papers (can't remember the name) an article that contained a description and illustrations of a non-intermittent projector. This machine had proven highly satisfactory under test and was then ready to be put into production. I should very much like to know if this machine was ever manufactured and if not, what has kept it out of production. Are any of these non-intermittent projectors being used today, and if so, in what theatres?"

Come on boys, help a fellow craftsman.

● Television definitely is one of the outstanding achievements of our time and will be a factor to be reckoned with in the post-war days when the cloak of mystery is lifted from the remarkable strides made in its development during the past few years. I.P. is now running a series of articles on this subject (TELEVISION TODAY), covering every phase of the art. We cannot stress too strongly the important role television will play in our lives in the post-war period, and suggest that our readers make it their business not to be caught napping when the wraps are finally lifted from this new electronic art.

● We ran into our very good friend, P. A. McGuire, Director of Public Relations for N-S-B, on a recent trip we made to Washington, D. C. Mac was invited to address the membership of Local No. 224 at its last meeting and his talk was, as usual, warmly received.

Water Analogy of the Decibel

WHEN the word decibel is mentioned how many of us assume a blank stare or a puzzled expression? Quite a few, no doubt, and unless we are continually in direct contact with this generally used unit of measurement for electronic equipment it will be just a word to us and nothing more. The unit is used to indicate two different, though related characteristics, and this has added to the confusion of the uninitiated.

In an amplifier, the ratio between the input and output signal (gain or loss of the amplifier), or the ratio between the power output and some predetermined unit of power (level) is expressed in decibels (db). The blame for confusing the measurement of these characteristics, or sound intensities, by the use of the decibel cannot be placed on the scientists. While the name of the unit, *Bel,* was chosen to honor a great scientist, the method of measurement was made necessary because of the way nature constructed our ears. Since the *Bel* is such a large unit, the decibel, which is one-tenth of a Bel, is the commonly used unit.

As many of you must know, this unit is also used to designate the loss in volume controls, attentuators (*L. T.* and *H-pads, etc.*), speech transformers, and networks. The decibel pertains to the characteristics of equipment used for the transmission of music, speech and similar signals and not, for example, to the power consumed in operating the rectifier circuit and heaters of the amplifier.

Doubling the Power Adds 3 DB

In most measurements with which we are familiar, such as the measurement of distance, weight, electrical power, etc., that which is known as the linear system is used. This is easy for us to understand because any number of feet, volts or amperes is a simple multiple of the unit of measurement used. A ten foot distance is ten times one foot, etc. The scientists found, however, that the human ear does not react to a change in sound intensity in this manner. It was found that if the output of an amplifier, as measured in watts of power, is doubled the sound reproduced does not appear twice as loud to the ear. Or, of the power output is increased, let us say from ten to twenty watts, it does not create the same impression on the ear as an increase from fifty to sixty watts. Furthermore, the change in power necessary to create the impression of an equal change in sound intensity is greater at high levels of sound than at low levels. In the case of an increase from 3 db to 6 db both power and sound level are doubled.

Gain Formula

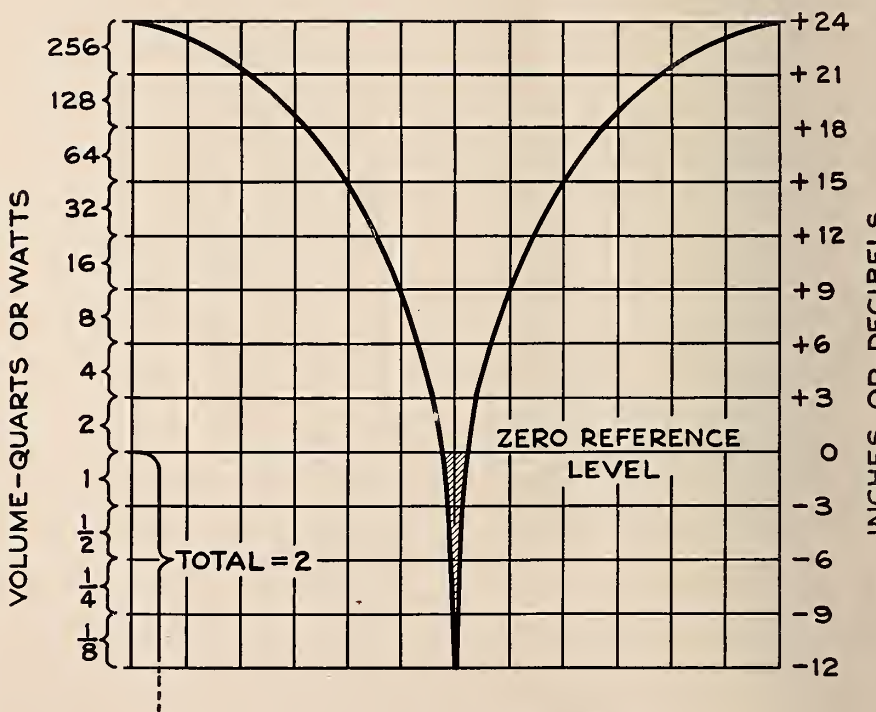
It is apparent that some method of relating sound intensity, or impression on the ear, to the power in watts should be adopted to clarify this situation. It so happens that this relation is logarithmic and therefore the formula developed for calculating the gain (or loss) of an electronic device in decibels is as follows:

$$Decibels = 10 \; log_{10} \left\{ \frac{\text{Power Output (in watts)}}{\text{Power Input (in watts)}} \right.$$

Having determined a method of measuring the gain or loss of a device, a measure of the intensity or level of the output signal still remains to be established. A great deal of study was given to determining the level of intensity that is just audible to the human ear, and then relating it to watts. Thus the threshold of audibility or zero reference level, as it is commonly called, was fixed. The reference level generally used is 0.006 watts (six milliwatts). The result is that there is a standard method of measuring the gain of an electronic unit and also the intensity of the output signal.

Two devices, therefore, can be compared on the same basis, but the variable of frequency now enters the picture. It is quite in order to say that an amplifier has a gain of so many db and that the output level is so many db, but unless the frequency is stated the data is not complete. While gain and output level of an amplifier may remain constant within a certain range of frequencies, there will be a deviation if the limits are wide. We probably are familiar with this characteristic under the term frequency response. The frequency response depends upon the characteristics of the components: transformers, inductances, capacitors, and vacuum tubes. In general, amplifiers are designed to meet certain specified conditions, and thereby the applicable frequency response is largely predetermined.

For the benefit of those readers who may be unfamiliar with the term "logarithm," we quote the definition found in the dictionary: *"A logarithm is the exponent of the power to which a fixed*



DECIBELS = 10 LOG $\dfrac{\text{WATTS OUTPUT}}{\text{WATTS INPUT}}$

INCHES = 10 LOG $\dfrac{\text{FINAL VOLUME IN QUARTS}}{\text{INITIAL VOLUME IN QUARTS}}$

FIGURE 1

number (the base) must be raised in order to produce a given number." There are two systems, but in the one most generally used the base is 10. The exponent then is the number of times 10 must be multiplied by itself in order to produce a given number. For example, since 10 x 10 = 100, the logarithm of 100 to the base 10 is 2. The exponent may just as well be a decimal as a whole number and in that case straight multiplication would be somewhat complicated. Therefore tables have been prepared whereby such computations may be made by taking suitable data from them. This will be illustrated in a later example.

Comparison of Power Output

A clearer understanding of the use of the decibel as a unit of measurement may be arrived at by comparing sound level with the level of water in a vessel. This vessel will be in the form of a horn-shaped vase, or the shape may be more familiar if we say that it closely resembles an expotential high frequency horn with the small end as a base. This is illustrated in Figure 1.

We measure the amount (volume) of water necessary to increase the depth from one inch to two inches, from two inches to three inches, etc. It is obvious that a far greater amount of water will be necessary to increase the depth one inch as we approach the top than is required at the small section near the base. To compare this with the measurement of sound intensity, consider the depth to be the sound level measured in decibels and the volume of water to be the power in watts.

If the vessel is shaped correctly (for all practical purposes) twice as much water (watts) will be required to increase the level from six to nine inches (decibels) as is required to increase the depth from three to six inches. Again, twice as much water (watts) will be required to increase the depth from nine to twelve inches (decibels) as is required to increase it from six to nine inches, and so on indefinitely depending upon the size of the vessel. In other words, doubling the power output in watts brings about an increase of three db in sound level at any point we choose to select. This serves to illustrate the condition that to bring about equal changes in sound intensity, as heard by the ear, increasingly greater amounts of power in watts is required as we reach higher sound levels.

Solution of a Gain Problem

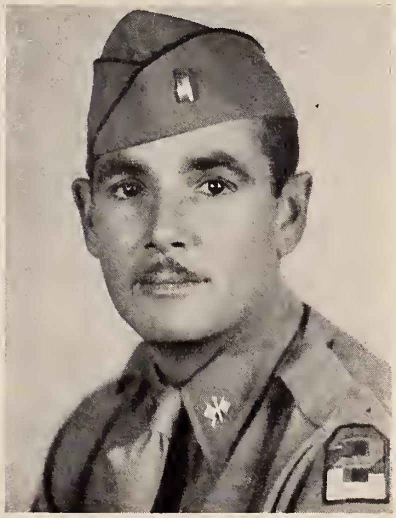
To carry on the water analogy, suppose we solve a typical problem in which we start with 16 quarts of water (watts) in the vessel, the level of water being 9 inches (db). This is analogous to amplifier input power in watts. There is now added to the water in the vessel 112 quarts, making a total of 128 quarts of water (watts output), the water level being 18 inches (db). Substituting these values in the decibel formula given earlier in this article, we obtain the gain as follows:

$$\textit{Ratio of change (db)} = 10 \log_{10} \frac{128}{16} = 10 \log_{10} 8 = 9.031 \textit{ (gain)}$$

Actually in making such measurements, power input and power output measurements are not made but an in-

(Continued on page 30)

Introducing: Lt. Merle Chamberlin



MERLE CHAMBERLIN, now a lieutenant in the 165th Signal Photo Corps, U. S. Army, and currently stationed at Camp Crowder, Missouri, is a native Californian, and while attending high school in Huntington Park around 1924 felt the urge for some money to augment his allowance, which resulted in his becoming a candy butcher in the old Burbank Theatre in Los Angeles. Being the most loquacious of the crew he landed the center aisle, making something of a sales record on the job, collecting about $35 a week in commissions. This was too much money for a single man, so Merle got married.

After the knot was tied he decided it would be pretty silly to work for the next 30 or 40 years as a candy salesman in a theatre so he kept his eyes open around the Burbank and eventually put the finger on the film percolators. The deck hands had a good deal—they even got to work back there with the chorus girls. And the actors were glamour plus —but they always were broke. So Merle cast longing eyes at the projection booth. That was his place, he decided, six days a week and good dough, with the boys in the booth seemingly always gaining weight, so it was a cinch they weren't doing any heavy labor and were eating regularly.

He learned the fundamentals from the Burbank projectionists and others in town and before long he had a Los Angeles license, from the late Connie Harden (one of the finest union men Chamberlin ever met in California). He finally became a member of Local 150 and tackled more than a score of theatre jobs before going out to the studios.

Chamberlin decided that a real pioneering job was being done by the studios, so he stuck around. It all seemed topsy-turvey. but that was his spot. Local 165 finally was organized and all has been peaches and cream ever since.

He landed the chief's job at MGM in 1935, where he enjoyed life with a swell crew, good equipment, and an up-and-coming local to work with. Then the war came along and Chamberlin knew it was for him personally. So he joined up and, as he says, has learned plenty since then. When the last shot has been fired he plans to return to his old love.

"When I say I have learned plenty," Chamberlin states, "I mean that if any of your readers think they are getting pushed around, tell them to join this man's army, where they will get thrown in with men from all walks of life, and then ask themselves what is wrong with their own profession. It sure teaches one to take nothing for granted.

"This projection is one of the best trades, and for all those guys who are just sitting back resting on their laurels and their contracts—making no attempt to better their knowledge of the trade, making no attempt to protect what they have by the simple expedient of keeping technically ahead I have this to say: You are just plain nuts, boys. When this war is over every screwball who has touched a 16-mm outfit in the Army is going to decide that he is a projectionist —and unless you can show them up, you will be in trouble. I would like to have a dollar for every private who has asked me about the trade."

Chamberlin has a daughter and a son-in-law (who hasn't yet shown any signs of wanting to learn the trade), and a granddaughter who is the cutest, smartest, prettiest, etc., etc., etc. She's only nine months old, but way ahead of the run-of-mill granddaughters, according to this typical granddad.

This is the fourth in our series of who's who in the projection world. From time to time. I. P. will present to its readers brief word portraits of leading figures in the craft.—Ed.

iP AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Grounds: Their Effects on Amplifiers

I have lately encountered several cases where induced hum for radio station signals were being picked up by theatre equipment and then amplified to disturbing levels. One such case occurred in a theatre located next to a police radio station. Very often the signals from this radio station would ride over the level of the sound from the picture being presented in the theatre, and my first service job was to eliminate this trouble.

The first step, of course, was to find the source where these disturbances originated and by what means they reached the amplifier — whether capacitative or reactive coupling, or, direct modulation. Therefore, I placed a short circuit across the input to the amplifier, so as to isolate this part of the system from the preceding apparatus. This particular case proved the signal to be just as strong with the short across the input as without it, thereby proving that the signal was being picked up either through the grid, heater or cathode circuits of the voltage amplifier stages.

The next step was to block the grid of the second stage. The signal was not entirely eliminated but was reduced by a proportional amount, equal to the gain of the stage. The system ground was then suspected as being the cause of the trouble and the following tests were made:

The short was removed from the amplifier input and the volume control was set to the normal level required for a full house. The ground wires were then removed from each machine pedestal, carefully noting the change in volume level with each operation. The signal was completely eliminated only after the removal of the ground wires from the amplifier and associated apparatus.—D. Ferguson, *RCA*.

Conserving Projector Framing Lights

Many projectionists are experiencing difficulty with framing lights on various types of machines. These lamps while of the standard 110-volt variety are rather small and frail, and have a tendency to burn out on excessive line surges. A small standard 10-watt lamp wired in series with the framing light will dim the framing light slightly, but will protect it from line surges, thereby increasing its life many times.—C. R. Shepard, *RCA*.

Protecting Eyes from Glare

The glare from Tungar and Rectigon bulbs which are used as high current rectifiers may be diminished and the eyes protected by using translucent or dark colored glass when viewing the tubes in adjusting taps, resistors, or in making other adjustments.—Clifford D. Welch, *RCA*.

Draining Soundheads

I find it simply impossible to get the sludge and dirt out of soundhead gear boxes by simply draining them. The sludge sticks to the walls of the gear box when the oil is removed and mixes with the new oil as soon as the motor is started.

Soundheads can best be cleaned by removing the cover and wiping the inside clean with a lintless cloth. While the case is open it is a good time to check the two bronze gears for wear. In many cases the gear that drives the projector head may be found worn, and it is advisable to interchange the gears thus prolonging their usefulness.—C. L. Swinney, *RCA*.

Checking Capacitors for Leaks

A quick, easy and efficient method of determining the condition of capacitors of ½ (or more) microfarad, in lieu of a capacitor bridge, is to place a voltmeter or milliameter in series with one lead of the unit to be tested and turn on the equipment as for normal operation.

The leakage current should not exceed ¼ mill per microfarad (although a leakage of ⅛ mills is preferable). However, the ¼ mill is an indication of a satisfactory condition for normal use. If the voltmeter is used it should be set to a voltage range close to the working voltage of the unit under test, so that the kick will not damage the meter during the time required to charge the capacitor. After the voltmeter needle has settled to a low reading, the scale setting may be changed to a value that will permit approximately ½ scale reading. A voltmeter, when connected in series with a circuit becomes a milliameter. By measuring a few capacitors of different values and making note of the scale readings for the particular meter you have, it will be quite easy to determine whether the capacitor is leaking or shorted, and to what extent.

The method outlined above is applicable to all forms of capacitors. However, the leakage current mentioned is for filter or by-pass capacitors. Coupling capacitors should not show any leakage whatsoever. Coupling capacitors should be removed from the circuit and tested at the rated voltage in a manner that will permit the leads to be pulled slightly in order to show whether or not the unit is intermittently breaking the circuit for an open condition.—D. Ferguson, *RCA*.

Cleaning Crackle-Finish Projection Equipment

There has been much experimentation in an effort to find a satisfactory method for cleaning morroco or crackle-finished surfaces, such as is used on the majority of projection room equipment of recent manufacture. Charles A. Vogel, Local 369, Huntington, W. Va., offers the following suggestion:

After removing all the loose dust from the equipment with a soft rag or dusting brush apply pure boiled linseed oil to the soiled surface. Use a soft rag for this purpose that is well saturated, but not dripping with oil, and do not wipe the equipment dry for at least one-half hour. After that time, polish with a soft dry cloth. Oil applied in this manner will harden into a soft lustrous finish that will outlast previous treatments.

In the hard-to-get-at places the oil may be rubbed in with a toothbrush.—C. R. Shepard, *RCA*.

Correcting Poor Tube Contact

On many calls where the complaint was fading sound and low gain, the trouble was found in the MI-1497 amplifier in which the 1612 tube was making poor contact. Rocking the tube in its socket usually eliminated the trouble, but it always reappeared in a few days. By bending the tube prongs inward towards the bakelite anchor pin, the

(*Continued on page* 24)

Drive-In Theatres of the Past, Present and Future

By *LEROY CHADBOURNE*

IT WAS NOT so many years ago that a new type of theatre made its appearance. Patrons simply drove their cars into a specially graded area. parked and saw a movie without even getting out of their cars. At the time the war started there were nearly one hundred such theatres throughout the country. In size they vary from around three hundred car capacity to about twelve hundred.

For the benefit of those who have never seen a drive-in theatre, the car parking area may best be described as being shaped like a piece of pie with the screen at the point (Figure 1). Cars park in circular form facing the screen. If the area is level, the ground is graded so that the front of the car is raised in order that a full view of the screen may be obtained from either the front or rear seat. For the larger theatres the depth to the last row of cars is approximately six hundred feet and the width at the rear about eight hundred feet.

Standard Indoor Equipment

The first theatres built used standard indoor theatre equipment, except that the amplifier capacity was increased. The projection room always has been located some two hundred feet from the screen and sunk in the ground so that the projection ports are just above the ground level. Since the bottom of the screen usually is about twenty-five feet above the ground an upward projection angle results.

Speakers were located either above (Figure 2) or below the screen and positioned to cover the area. With this arrangement there was a lag in sound in the distant parts of the area. So to overcome this illusion difficulty, special projectors were introduced which allowed for a decrease in the length of film between the picture aperture and the sound gate or sound scanning point. With this change, lack of synchronism between picture and sound was not noticeable.

As time went on two-way speaker systems were introduced to the drive-in with a great improvement in quality. But nearby residents began to complain that escaping sound was annoying. With central loudspeakers that give adequate volume and coverage of the area there always has been a spill-over problem. This has become increasingly serious as the area around existing drive-ins has been built up. Using conventional speakers, located at the screen, it has not been possible up to the present time to eliminate sound leakage beyond the area. There have been reports that sound has been heard five miles beyond the drive-in area. This, of course, has been under ideal conditions and probably with a helpful wind. With a cross-wind fading is experienced and on rainy nights sound decays rapidly. These latter two conditions are aggravated when it is necessary to close the car windows.

Individual Speaker Systems

To overcome these difficulties localizing of speakers was introduced. In one type of installation small speakers were located on posts in front of, but to the side of every two cars. Both quality and illusion suffered. If a person sat on the side of the car toward the speaker, volume was adequate, but it was very evident that sound was not coming from the screen. On the side away from the speaker, volume was too low and the illusion still not good.

A very interesting form of local speaker was located below ground level, one for two cars. The horn was constructed of cast concrete, in a reflex exponential form with the speaker pointing downward. A grating protected the speaker and each horn had a drain to carry off rain water. Here, again illusion and quality were far from ideal.

It can readily been seen that the cost installation of either of these types of speaker systems is extremely high. If the cost of the speakers themselves is included it may well be as much as one quarter of the total cost of the entire theatre. Maintenance is high too since the speakers are subject to weather changes.

Just before the war stopped all installations of drive-in theatres, a third type of individual speaker was becoming increasingly popular. It was of the portable type and hung on the inside of the door of each car. A plug on the end of the speaker cord was plugged into a post-mounted jack at each car position by an attendant. Each speaker was equipped with a volume control so that each car had individual control of the

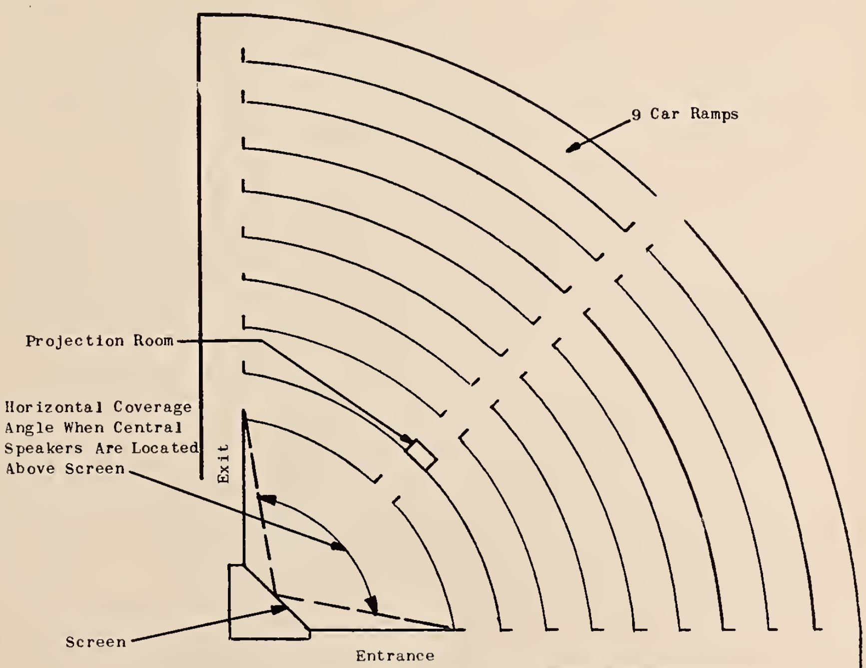


FIGURE 1. *Plan view of typical drive-in theatre*

volume. By means of an ingenious device attached to the plug it was not necessary for the car driver to leave the car to disconnect the plug when he was ready to leave the theatre. As he backed the car to drive to the exit the plug automatically was disconnected without damage to either the plug or the cord. With this type of speaker illusion is excellent, but quality is comparable only with an automobile radio—and not with a good one either.

Installation and initial equipment costs are high, and maintenance of the equipment is expensive. Due to the necessity of handling the speakers when they are installed in the cars and when they are removed, extra attendants are required—increasing the operating costs. Occasionally if attendants are not on hand to remove the speakers at the exit, some patrons become impatient, throw the speakers on the ground and drive off. Thus we have an additional danger of damaged speakers.

We find now, however, that these difficulties have led exhibitors to question the continued use of this type of installations. It does solve the spillover problem, retains the necessary illusion and gives each car control of the volume. On the other hand quality is by no means comparable with that in an indoor theatre and tone quality conscious patrons would not then be satisfied. Until some new method of projecting sound in such areas is introduced, it seems that the in-a-car speaker will be the best compromise in areas where residences are close enough to the theatre to come within range of sound projected from speakers located at the screen.

Where the Patrons Come From

Now that we have discussed the various types of installations employed to date, let us consider who are the patrons of these drive-in theatres. There are several classes of persons who are regular customers. First on the list is the family with one or more small children. Such a complete family can drive into the theatre, the children either may watch the picture or sleep on the back seat, and there is no problem as to how the children will be taken care of if the parents go to the movies. In some instances such a family might never see a movie otherwise. Second on the list is the older couples who find it tiring to go through the procedure of getting to an indoor theatre. A bus or trolley ride with the attendant waiting and walking or the difficulty in finding a place to park within a reasonable distance of the indoor theatre make the drive-in theatre particularly attractive to a number of people.

We might include younger people who either from curiosity or the desire for a breath of air on a warm night prefer to be outside looking at a picture instead of being indoors. These people in their car have as much privacy as at home. They may talk without annoying other patrons or smoke without breaking any rules or having to sit in special sections of the theatre. If the theatre presents a good program there is no reason, under normal circumstances, why they should not become steady customers. The ease in getting into and out of a drive-in theatre is another reason why they should become more popular than ever.

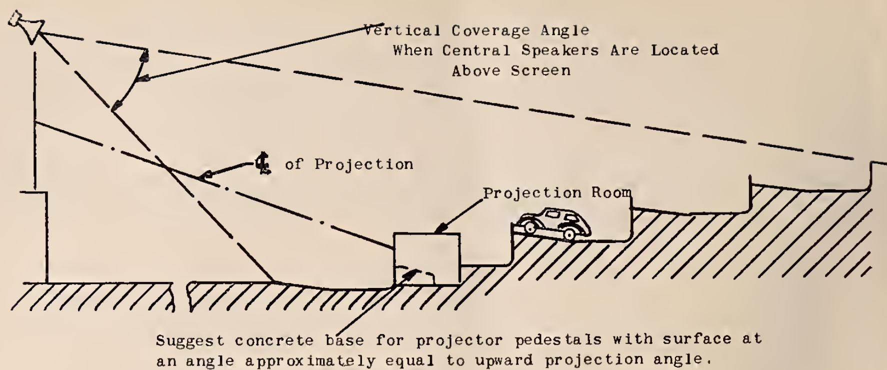


FIGURE 2. *Side elevation of typical drive-in theatre*

Regarding the future of drive-in theatres, it is obvious that they are here to stay. Since they usually are located on main highways out of town and since their patrons have a special reason for going to the drive-in theatre there is no reason why they should compete with indoor theatres. It actually supplements the indoor theatre and thereby increases the number of movie-going persons. Drive-ins usually are located so that they draw their patrons from a number of towns. It may be that the theatre is located just outside the boundary of a large town and that there are several small towns nearby. In such a case customers come from the whole area. By the law of averages the attendance should be fairly uniform.

New Drive-Ins After the War

As soon as conditions permit it is to be expected that a large number of new drive-in theatres will be built and this means more opportunities for projectionists. Of course in the North these theatres run only from early spring to late fall, but in the South they will run the year round. It is true also that shows are given only after dark and in some cases not every day in the week.

Many of the drive-ins have used high intensity lamps because of the long throw and projection in open air, but with the introduction of coated and faster lenses that is no longer necessary. Arc lamps comparable with those used in the average indoor theatre can be used with just as good, if not better, results. There is no reason why an excellent picture cannot be projected on the screen of an outdoor theatre.

In passing it may be said that when glassed projection ports are used they must be cleaned carefully daily. Dust and cobwebs gather rapidly and we all know what happens to a picture then.

Control of volume in a drive-in presents a somewhat different problem from that in an indoor theatre. When central speakers are used, the volume setting required depends upon the number of cars in the area, the strength and direction of the wind and whether it is clear, cloudy or rainy. It can in no way be the projectionist's responsibility to determine the setting from the projection room, but if he studies the conditions at his particular location he can rather

(*Continued on page* 28)

INGENUITY IN REPLACING PARTS ESSENTIAL

Vic Murcher, who heads sales for the Clarostat Manufacturing Company, Inc., regards ingenuity and patience as the salvations of wartime servicing. Mr. Murcher keeps in close touch with wartime servicemen not only through his jobbers, but also through government and trade association activities aimed at keeping those home radios working—for the duration at least.

In pointing to difficulties in getting replacement parts he said that manufacturers are engaged 100 per cent on war production. "In our own line," he continued, "such items as ballasts, bleeder resistors and exact-duplicate volume controls no longer are in regular production. If we get an order for one or two items, even though standard but out of stock at the moment, we just can't fill the order. We must wait until there is a sufficient backlog of orders to warrant setting up, begging for materials, and putting through an economical production run.

"Meanwhile, there is much the serviceman and his jobber can do. So please do your share. Substitute or improvise with standard parts or values wherever possible. Cooperate with parts manufacturers in making a success of such Victory types as may be set up. Use that 'hell' box of junked parts and use the parts from discarded sets whenever possible in securing items that still have some useful life left in them."

Success Is Seen in Fight on Tuberculosis

Now being laid, during the hectic war period, is the foundation for ending tuberculosis in the United States, and for its control throughout the world, according to Howard W. Blakeslee, science editor of the Associated Press, with the outlook for success being regarded as good. The view is held in the face of the fact that, in long wars, tuberculosis has been a prime factor in raising the general death rate. The rise already has come in Europe and the first signs appeared this spring in the United States, where the general tuberculosis death rate still was falling, but where an upturn came among the young.

"Certain major records favor the hope that this war can be used as a springboard to end tuberculosis," Mr. Blakeslee declared. "In World War I in Germany the tuberculosis death rate rose 61 per cent; Italy 44 per cent; England 42 per cent; the United States 6 per cent.

"Authentic reports from Germany and Italy have not been available since the start of World War II. Meager reports from France show that deaths from tuberculosis have increased. But England held her increase in deaths from the disease to about 12 per cent during 1940 and 1941 and during 1942-43 the number of deaths dropped to the 1938 level, which is the lowest on record. The tuberculosis death rate in the United States during a period lacking only a few months of the duration of her participation in World War I was still dropping. Our 1941 death rate was an all-time low of 44.4 per 100,000, probably will be about 43 for 1942, and this year to date is down 5 to 5.5 per cent further.

"There are many angles behind this hopeful side. But the main weapon by which Americans propose to drive tuberculosis from the land is the chest X-ray. And in particular the way in which this detector is being used. The U. S. Public Health Service and State tuberculosis organizations are extending the chest X-ray to war industries. The Public Health Service has at least a score of photo units at work this year for industry.

"The service is extending its offer of services to families of workers found to be tubercular. The War Emergency Committee of the National Tuberculosis Association has recommended to local associations many measures, including special attention to women employes and emergency housing conditions.

"Tuberculosis is coming to light in a great sector of the population where it was never before searched out on a large scale. The magnitude amounts to something new in this health battle. The momentum here and in England promises success for international post-war control activities, now planned by the U. S. Public Health Service and the National Tuberculosis Association."

AT YOUR SERVICE

(*Continued from page 20*)

tube will fit snugly and trouble from that source will be completely eliminated.

In cases where one of a pair of 6L6 tubes in a MI-4288 or similar type amplifier was drawing excessive current while the other one was not drawing any, the aforementioned remedy was tried with the result that both tubes drew normal current. This method may save many a choke.—A. Kunze, *RCA.*

Test Film Container

The small round can in which candid camera 35-mm negative is purchased, makes a very useful container in which to carry test film. I always carry a small strip of 7,000 cycle film in this manner, and I find it very handy for immediate use.—A. C. Holland, *RCA.*

Correcting Lamp House Reflector Breakage

Here is a case of lamp house reflector breakage with a distinct "Ripley" flavor. On a recent trouble call the manager of a theatre complained of reflector breakage due to cold, etc. He also stated that whenever the switches were set up in a certain emergency position (both arcs on either rectifier) a D. C. arc fuse would invariably blow up.

These two apparently unrelated conditions gradually began to merge in my mind. Tests showed that the arcs were burning backwards on the emergency position. This, of course, directed a sudden hot arc flame from the positive carbon right at the top of the reflector. The theatre manager had been under the impression for nearly a year that he had an emergency arc set-up. Periodic check-ups had been limited to just striking the arcs.

However, this situation was remedied by correcting the arc cable wiring and the source of reflector breakage and fuse blowing was completely eliminated.—R. W. Rushworth, *RCA.*

Cleaning Optical Slits in Lens Tube

In cleaning optical lens tubes there are instances where the oil has dried in the slit and will not dissolve even when brushed with a soft brush and carbona. Of course, no metallic instrument should be used in cleaning the slit, even if one fine enough could be obtained. I have found that a small piece of scrap film could be used without injury to the slit. If the edge of the film is rubbed along the slit it becomes thin enough to clean it thoroughly.—R. O. Northrop, *RCA.*

Correcting Noisy Volume Control

The next time you have a noisy volume control to cope with and you are tempted to reach for the order pad try this before you write the order. Lift an eye dropper from the family medicine cabinet and keep it in your tool kit with a small bottle of carbon tetrachloride. Force some carbon tetrachloride in the volume control at the lugs and let a little of it run down the shaft. Work the control up and down a few times and you will find it as good as new. This applies to carbon as well as wire wound controls.—J. Miller, *RCA.*

Repairing No. 26238 Exciter Lamp Holder

Occasionally the center contact stud pulls through the bakelite insulating washer when the latter becomes charred from excessive heat. Here is a quick emergency method of restoring the holder to use. Cut the soldering lug off a small spade terminal to form a "U" shaped washer. Place it under the contact stud and squeeze together. This prevents the contact from pulling through the enlarged hole in the bakelite.—R. H. Bisbee, *RCA.*

Setting Simplex Rear Shutter Projector

The easiest and most accurate way to time a Simplex rear shutter projector is to bring the intermittent sprocket to rest. Then hold a screw-driver or some kind of a marker on one intermittent sprocket tooth. Turn over the projector by hand, slowly, until two sprocket teeth have passed your marker (two sprocket teeth equals half a frame). At this point set the shutter (exactly in the center of one blade) directly in the center of

the aperture. Tighten the shutter locking screws and re-check for accuracy.—EMIL DE NEUF, *RCA*.

Controlling Oil Drippings

Oil drippings can very easily be controlled by attaching a piece of wire where oil collects underneath the soundhead. Attach this length of wire by soldering, or by any other means adaptable to the situation. The wire can then be bent to direct the oil to a pan or some other receptacle.—H. M. MORROW, *RCA*.

Suggestion on Soldering

If a job in the projection room requires extra heat for soldering purposes, it will be found that with a little care the heat at the tip of a soldering iron can be raised to the desired temperature by holding it (just the tip) over the flame of a carbon arc. Make certain that the tip does not melt due to overexposure to the flame, and that the arc circuit is not grounded. While the iron will not hold the heat for a long period, it will be found that heavy lugs may be soldered when this method is used.—M. W. GIESKIENG, *RCA*.

Easy Method of Pulling Wire Through Conduit

When difficulty is encountered in pulling wiring through conduit the application of corn starch will be found much more effective than either grease or oil. —JOHN R. LOMAX, *RCA*.

Conservation of Tubes

In line with the conservation of material using an ordinary light bulb for exciting the p. e. cell and a D. B. meter across the output of the amplifier, a re-check of all used tubes was made in the various theatres being serviced. New tubes were compared with old ones, it was found in many instances where tubes were removed on account of a lowered reading of plate mills that they still were up to new tubes in gain.

In the case of power tubes, the adaptor was plugged into the socket and the tube into the adaptor with the meter showing the plate mills. The volume was advanced to the overload point first on a new tube and then the old tube was substituted. A comparison was made for the point of overload, with the volume control being manipulated to get the comparison. If the point of overload was quite a distance above the ordinary running point, the tube would give additional service. As a matter of fact, very few tubes taken out were found to be unusable.—H. D. GRAVES, *RCA*.

Removing Film Smoke and Fire Odor from Projectors

On fire and smoke cleanup jobs, make a thick paste of Old Dutch Cleanser and a little water. Using an old toothbrush, apply this paste to the projector surfaces to be cleaned. Scrub the surfaces well with the toothbrush and finish the operation by wiping off the excess paste with

a damp rag. You will find that not only will this remove all the smoke film but also most of the fire odor.—John R. Lomax. *RCA*.

Eliminating Static on W. E.-211 Soundheads

While making a service call at one of my theatres, the manager complained of occasional bad static conditions. This was particularly noticeable on well waxed new prints. The soundheads were of the W. E.-211 type and the trouble was located in the photocell circuits. These cells are well insulated by means of felt and have a tendency to pick up static from the scanner drum creating a brush discharge from the glass surface. The rear metal plate holding the cell was turned around and the trouble was corrected. This method grounds the glass and discharges static without entering circuits.—R. H. Davidson, *RCA*.

Correcting Erratic Operation of W. E. 314-Type Tubes

Two cases of flickering and erratic operation of W. E.-314 tubes have been cured by re-soldering the filament leads in the pins in the bases of the tubes. In each case the soldered connection looked as though the wire had been pulled back into the pin after it had been soldered.—B. D. Douglass, *RCA*.

Improving L. I. Lamp Projection

An effective way of producing a picture with low intensity lamps without the yellow of the arc predominating is to use a filter in the projection ports. By using glass with a slight blue tint, high intensity lighting may be simulated. Glass that is optically true must be used, otherwise a good focus cannot be obtained.—H. M. Morrow. *RCA*.

TELEVISION TODAY

(Continued from page 14)

There are a great many problems which have had to be overcome concerning both the apparatus and the methods used in television transmission. These, however, will be discussed in detail subsequently.

Operation of Receiver

Now let us consider the television receiver, but let us do so with the clear understanding that it is only part of a system.

The television receiver antenna is energized by the travelling waves which cause corresponding currents to flow from the antenna to the receiver. The receiver is tuned to the particular frequencies to be received in order to maximize the ones desired and minimize undesired ones, just as in sound receivers. These currents, even when tuned in to maximum, are very small and are amplified by vacuum tubes. When they are of a useful intensity they must operate a device designed to convert them into light images. This device is known as the "Kinescope" or the "Oscillight."

The receiver tube has a plate with a beam of electrons playing upon it just as does the pick-up tube. In it, however, the plate, or screen, is made differently. It is one end of the tube itself, made nearly flat, and coated on the inside with a very thin layer of material which has the property of fluorescing, or giving off light, whenever electrons strike it. Some fluorescent material will glow for some time after electrons have struck it. The particular compound chosen for these receiver tubes permits the glow to die out shortly after the electron beam moves away and before it returns again.

The tiny electron beam in the receiver tube, whenever it is not moving and therefore strikes the screen in one spot, causes a bright glowing spot on the screen at the point of contact. This spot is about the size of a pinhead. Although the glow is really on the inside of the tube, it is visible on the outside because the end of the tube is clear glass, and the screen of fluorescent material is very thin. The brightness of the spot depends on the strength of the electron beam and varies as the strength of the beam varies. That spot of light is used to reproduce each spot of the picture, one at a time, by moving it around all over the picture area. It must be moved in exactly the same way that the pick-up tube beam at the transmitter is moved,

which in the modern systems is in horizontal parallel lines from top to bottom.

So this beam will be very busy too. It is going to move all over the picture in regular fashion, and repeat the travel thirty times per second. Furthermore, while moving, it is going to vary in brightness continually as it "paints" the high lights and shadows of each tiny element of the picture. To our slowly reacting human eyes the spot will not be visible because it is moving so rapidly, and the screen will appear to be illuminated all over the picture area, but we must remember that actually the light and the scenes are caused by *one tiny spot of light*, flying over the screen, and varying in brightness as it goes.

Much of the receiver apparatus is for controlling the movements of the beam: feeding to it the currents which have been received from the transmitter in order to vary the strength of the beam and therefore the brightness of the flying spot. The beam of the receiver tube and that of the pick-up tube. many miles away, must be accurately synchronized and kept in perfect step. Thus it is how a picture image optically focused on the plate of a pick-up tube is reproduced on the fluorescent screen of a receiver tube.

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[1] The projection of motion pictures is made possible as a result of a physiological phenomenon known as the "persistence of vision." When the light emanated or given off by an object enters the eye an image is formed on the retina, which is a membrane of the eye that can be compared with the sensitive plate of a camera which receives the image formed by the camera obscura. This retinal image has a certain permanency. It lasts for a short while before being cancelled by the succeeding image or by its natural elimination proper to the functioning of the eye.

This permanency or "persistence of vision" depends partly upon the intensity of the light that concurs to form the image, and partly upon the intensity and character of the image that is going to supersede it. The effect of rapidly exposing the retina of the eye to several succeeding images is an impression consisting of the blending of each pair of images. The impression which an image makes on the retina is not immediate. It gradually increases until it reaches a maximum and then gradually decreases until it disappears completely, so when stimuli are made to react on the retina even in rapid succession they quite harmoniously blend into each other.

The action of the retina nevertheless is extremely rapid and the normal eye can perceive a flash of light only 1/8,000,000 of a second. In such short duration the impression is not brought to the maximum ability of the retina to collect it, so that a light of low intensity, but long duration. makes a greater impression on the retina than a light of higher intensity but of extremely short duration.

In all apparatus dependent upon the phenomenon of "persistence of vision" the length of the stimulus must be sufficient to make its full impression on the retina, and the intermittences must be of a duration sufficiently short to overlap the gradual decrease of the former with the increase of the latter. The most efficient duration of the stimulus in the presentation of motion pictures with the average light intensity of the projection arc is of approximately 1/50 of a second with an equal interval of darkness.

PLAN TO PUSH WAR OUTPUT

RCA theatre equipment and film sound recording executives, at a meeting at the company's Indianapolis plant, discussed means of maintaining production of film sound recording and projection equipment for the armed services and other branches of the government. In attendance from RCA Victor Division headquarters in Camden, N. J., were E. C. Cahill, manager, and David J. Finn, sales manager, of the Industrial and Sound Department. From the Phototone Section were Barton Kreuzer, manager; Homer B. Snook, sales manager, and H. J. Benham, commercial engineer. Edward Stanko represented the RCA Service Company.

RCA officials at Indianapolis who participated were Max C. Batsel, chief engineer; M. J. Yahr, theatre equipment product manager; D. Phyfe, theatre equipment systems engineer, and Ainslie R. Davis, film recording systems engineer.

KEEP BRAND NAMES ALIVE, URGES NATHAN B. GOLDEN

The U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, in a booklet just released "Advertising and Its Role in War and Peace," prints an article by Nathan B. Golden, Chief, Motion Picture Unit, Bureau of Foreign and Domestic Commerce, in which it is said that "maintenance of (brand) identity through advertising is necessary now more than ever before. This is especially true for those firms which are partially or temporarily out of the market because of scarcities or conversion of facilities to war production. Intelligent advertising tied in with the war effort can maintain the valuable good will of the product and keep alive brand names.

"We have had a 'stimulated' demand economy throughout our lifetime—and advertising has been the greatest stimulator. Now is no time to shut off the spark which energizes American business."

DRIVE-IN THEATRES

(*Continued from page 22*)

quickly anticipate what settings are required under the numerous different conditions encountered.

Future drive-in theatres will have to satisfy the following if they are to show real showmanship:

1. Present good pictures.
2. Have good quality comparable with the best in indoor theatres.
3. Adequate coverage of the area.
4. Eliminate spillover.
5. Employ good equipment and maintain it properly.

One of the common complaints against drive-ins is that they show nothing but old pictures. In the past this has been partly true due to the exchanges refusing to sell the later releases because of contracts with indoor theatres. In many instances the exhibitor has been short-sighted enough to believe that he will have customers regardless of the pictures that he presents. With the changing times, however, progressive exhibitors will realize the necessity for obtaining a good product and using showmanship in operating their theatres.

We hope that they also will realize that they cannot install inferior equipment in their theatres and expect to put on a good show. It just does not work that way. Even though the theatres operate for only a few months in the year, patrons expect a good show without the breaks attendant upon the use of poor equipment.

The real problem to be solved in future theatres is the elimination of spillover and still have good quality and proper coverage. It matters not whether the theatre is built in an area that is unpopulated and there are no residents to complain. With the present tendencies to migrate to the suburbs, the adjacent plots no doubt will be built up within the life of the theatre, and then the exhibitor's troubles will begin unless he has anticipated such a condition. If, on the other hand, he does locate where houses are close he must eliminate these conditions initially. We feel confident that this problem will be solved and that the future of the drive-in theatre is very bright.

SMPE Aid to War Effort Highlights Discussions

Highlighted at the 54th semi-annual technical conference of the Society of Motion Picture Engineers held last month in Hollywood, Cal., were discussions on what the engineering branch of the industry has contributed to the war effort and consideration of the competitive problems which motion pictures will confront in the post-war period.

At the gathering, held in the Hollywood Rooosevelt Hotel, Allen G. Smith, chief of the Service Equipment Division, Amusement Section, of the War Production Board, said that the nation's theatres are being supplied with needed accessories and repair parts. He pointed out that repair parts will carry the highest rating with WPB, and he praised the engineers for setting standards which, he declared, are being used by manufacturers of secret military devices.

Y. Frank Freeman, president of the Association of Motion Picture Producers, and Paramount studio head, welcomed the delegates at the opening luncheon meeting. He stressed the progress made by television and the competition to motion pictures it probably will offer, and he further expressed confidence that the engineering and technical brains of the industry will accept the challenge and their responsibility to devise ways and means of offsetting it.

Herbert Griffin, SMPE president, presided at the opening luncheon, with about 200 being present.

New officers elected are: Donald E. Hyndman, Eastman Kodak Company, engineering vice-president; Arthur S. Dickenson, MPPDA, financial secretary; E. Allen Williford, National Carbon Company, secretary, and M. R. Boyer, Du Pont Company, treasurer.

COPPER OXIDE RECTIFIERS

(*Continued from page* 10)

the former method of cooling the rectifier units. The construction of such a device without the use of air filters is definitely not recommended. The amount of dust collected by the filters is amazing, and this is the dust which would otherwise collect around the fins, causing them to overheat and eventually fail. Copper oxide rectifier units are designed to run at a definite temperature at their rated load, and if this temperature is steadily exceeded the life of the rectifier is considerably shortened.

The construction of this unit was made possible through the cooperation of our chief projectionist, Mr. C. A. Dentlebeck, and the supervisor of maintenance, Mr. D. Axler. Since this unit has been in operation Mr. Dentlebeck has checked it closely and is pleased with its performance. Should any I. P. reader wish further information on the construction or operation of the unit described in this article, we will be very happy to be of assistance.

FIGURE 2

OWNERS ALERT TO POST-WAR NEEDS, SAYS AUGER

Motion picture exhibitors throughout the country are alert to post-war problems and opportunities, according to Edward Auger, national office representative of RCA's Phototone Section, who recently completed a nation-wide swing in behalf of RCA's Purchase Priority Plan.

Mr. Auger said that exhibitors everywhere are planning to modernize their facilities and thereby improve their business opportunities after the war. He was accompanied on his tour of New York State by Bernard Sholz, RCA theatre equipment representative in the New York region, and while in Camden, N. J., Mr. Auger conferred with Barton Kreuzer, manager of the Phototone Section; Homer B. Snook, sales manager, and J. F. O'Brien, assistant sales manager.

Theatre Television a Definite Postwar Development, Du Mont Executive Declares

HUGE expansion of television may be expected after the war, according to Will Baltin, program director of the Du Mont television station W2XWV, in an address before the American Television Society at the Hotel Capitol, New York City. He pointed to rapid postwar expansion of such stations, including small communities of modest means, and to the establishment of "television theatres" from coast to coast.

"Theatre television, to which millions will flock to see events of national importance, is as certain as the dawn of tomorrow," Mr. Baltin continued. "New developments in the laboratory indicate that this form of entertainment is going to electrify the amusement world in much the same manner as the talking picture did back in the late 1920's."

Many programs are radiated twice weekly to televiewers in New York, New Jersey and Connecticut, and Baltin further declared that the experience gained at the Du Mont station proved that a television station may be operated effectively with a small personnel and at a low cost.

Furthermore, he declared that the camera equipment used at the Du Mont station is so compact and flexible that it could be wheeled out of the studio, placed on a small delivery truck and rushed to the scene of a big news event, and there set into operation in about as much time as a newsreel unit. He also brought out that economical operation, plus low-cost equipment, will induce radio station owners and others to take a financial interest in television, and predicted that it would become a major postwar industry.

WATER ANALOGY OF DECIBEL

(*Continued from page* 19)

strument called a gain set is employed. This instrument, when properly connected in the circuit, gives a direct reading of the gain or loss of the device being measured. In this connection, one danger in making such measurements is that of improperly terminating the device being measured. Amplifiers are designed to work from and into definite impedances or electrical loads, and if other loads are used the gain and power will change.

We have already mentioned the frequency variable. Impedance is a second variable. In practice, a source of constant frequency, either a film or an oscillator, is used to supply input power to the device. With the gain set in the circuit, a series of measurements of gain with changes in frequency are made—the resulting data being the frequency response characteristic of the device. These data will tell us what the gain is for any frequency within the range covered, and since the input level is usually maintained at a constant value or can be measured if it does not change, we also have the output level of the unit.

Comparison of Water Level

As an illustratioon of the water analogy of level, let us suppose that all measurements of water level are to be made from the level which exists when the vessel contains two quarts of water (or two watts power). This, then, is our reference level in the same way that six milliwatts is the most common reference level in use for electronic level measurements. Let us assume that we need to add 1½ quarts of water to bring it up to our reference level; and then we add an additional 32 quarts. Referring to Figure 1, we see that the total amount of water added brings that level up to 12 inches (db) above the point we chose as our reference level.

If we referred to an amplifier, we could say that the output level of the amplifier is 12 db, zero reference in this case being two watts. However, this does not tell us what the total gain of the unit is, since at the beginning the level was at minus six and we added 1½ quarts to bring it up to our chosen zero reference. In this instance the total gain is from minus six to plus twelve, or a total of eighteen. This may be demonstrated by substituting the values in the decibel formula previously given.

So far, in this discussion of the decibel we have considered only one device. In a sound system there are several devices, which introduce either a loss or a gain in the signal before it finally arrives at the stage loudspeaker where it is transformed into acoustic energy, or sound, as heard by the human ear. Starting with the film, all losses and gains are added algebraically to arrive at the final net result and these values may conceivably be quite different at different frequencies. Unfortunately, losses are much easier to introduce than gains, hence the repeated entreaties to keep the sound systems in good order and repair.

For instance, let us start with the exciter lamp. If this lamp is not positioned in three directions: vertically, laterally, and longitudinally, losses are introduced that are not considered in the design of the equipment. In other words, the light beam must be exactly centered on the slit in the lens tube and must be carefully focused on this slit if not, the gain is reduced and the frequency response changes. In passing through the lens tube some loss of light takes place. This loss can be measured at all pertinent frequencies and since the recording level of the test film being used is known, suitable corrections in the test data can be made.

The photocell does not respond equally at all frequencies, but again these deviations may be measured. Losses occur in the coupling circuit between the photocell and the input of the pre-amplifier. The design man can determine, therefore, the optimum input level at the pre-amplifier with frequency. At this time consideration must be given to the loudspeaker system that is to be used and the acoustic response, or efficiency within the frequency range, must be known. The network then enters the picture as to losses and impedances.

Having considered the input and output elements of the system, the designer arrives at the total overall gain and power output required for the amplifying system to meet the specified limits of seats and auditorium volumes. The amplifying system may consist of two or more amplifiers (and possibly filters) for adjusting the frequency response to compensate for acoustic conditions in the various auditoriums.

It should be remembered that once gain is lost at any given (or band) frequencies it is gone forever. This means that provisions must be made to attenuate predominant frequencies as required to obtain the desired overall frequency response. So, by adding gains and losses algebraically, the design man develops his amplifiers, introducing compensating resistors or capacitors as required in order to adjust the response until the final characteristic is obtained. All this time he is at least knee deep in decibels, which he finds extremely useful in obtaining a clear picture of the relation between his results, as measured in db, and the intensity of the sound reaching the ear of the theatre patron.

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VOLUME XVIII DECEMBER 1943 NUMBER 12

Resistance of Glass to Thermal Shock†

By *CHARLES D. OUGHTON*

SCIENTIFIC BUREAU, BAUSCH & LOMB OPTICAL CO.

THE breakage of reflectors, condensers, and occasionally projection lenses from heat is a common occurrence in lanterns with high intensity arcs. This is in accord with a number of everyday experiences, such as hot glass cracking when placed in cold water or touched to a cold object. Such breakage is a result of the tremendous shock to which glass may be subjected by even a small change in temperature. When costly optical glass is involved the phenomenon requires investigation from the practical viewpoint of how to make glass resistant to thermal shock.

Several general observations concerning glass should be noted. Glass expands when heated. The fractional amount by which it expands per degree of temperature rise is known as its coefficient of expansion. The coefficient varies with the composition of the glass; for example, glass having a relatively low percentage of silica has a high coefficient of expansion, while glass with a high silica content has a low coefficient of expansion.

If one section of a plate of glass is raised to a relatively higher temperature than that of the surrounding or adjacent glass, the heated portion expands. The thermal gradient from the heated section to the surrounding glass with a corresponding change in dimensions introduces stress. When stress exceeds the tensile strength of the glass a fracture occurs. Glass having a low coefficient of expansion will permit a greater temperature gradient for a given amount of stress than will glass with a high coefficient of expansion.

Stress caused by the thermal gradient produces strain in the glass. Two conditions of strain exist that are of interest in this instance—tension and compression. Bending a bar of glass places tensional strain on the side being stretched and compressional strain on the side being squeezed. A neutral layer of no strain will pass through the central region of the bar.

Glass fractures originate in a region of tension. Considerable tension may be easily introduced where a flaw or weakness is present in the glass. Flaws are often microscopic and unnoticeable. It is reasonable to assume that surface flaws should weaken glass more than internal flaws and, correspondingly, more fractures originate at the surface.

With these considerations in mind, two solutions are available for increasing the resistance of glass to thermal shock: first, the glass may be given a high silica content with a correspondingly low coefficient of expansion; and, secondly, the glass may be tempered to place the outer region or surface layers under compressional strain, thus preventing tension from reaching the surface flaws. This latter approach presents rather interesting results.

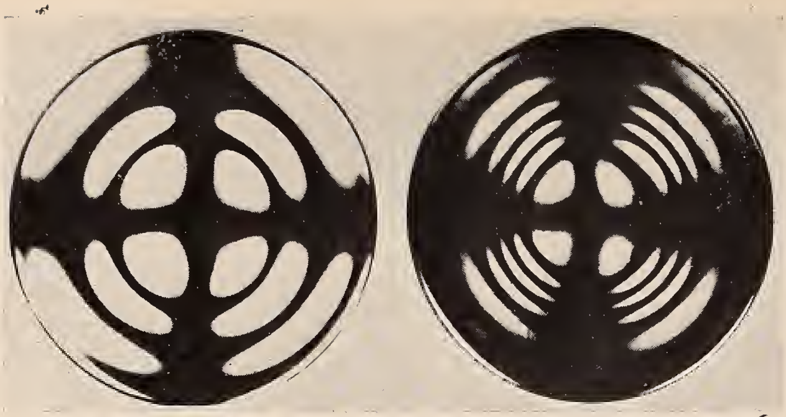
Tempering Glass

Tempering involves a heat treatment that is the opposite extreme to annealing. Annealing consists of slow cooling to remove strain. Tempering introduces strain by rapid cooling. In both instances the glass is heated to a temperature slightly below the softening tempera-

The resistance of glass to thermal shock may be increased considerably by tempering which is the controlled introduction of strain. Tempering and annealing represent opposite extremes in heat treatment. Annealing removes strain by slow cooling while tempering introduces strain by rapid cooling. Glass fractures originate in regions of tension. When hot glass is subjected to a cold medium, a thermal gradient is introduced and the resulting strain distribution places the surface in a state of tension. If the tension exceeds the tensile strength of the glass a fracture will occur.

Condenser lenses of projection machines are often subjected to thermal shock of this type. Tempering the glass places the surfaces under compression. A much greater thermal shock may then be applied without causing fracture, because sufficient stress must be introduced to completely neutralize the compression before the surface can go into tension and fail.

† J. Soc. Mot. Pict. Eng., October 1943.



(a) (b)

FIGURE 1. ***Polariscope strain patterns in condenser lenses (a) before and (b) after use with source of heat on plano side. The increased number of bands in (b) indicates that the compressional strain on the plano side has been partially removed.***

ture. In this temperature range the stress is completely removed from the glass.

By cooling slowly to room temperature, over a period of hours, the glass assumes an unstrained or annealed condition. By cooling the glass to room temperature in an interval of a few minutes, in a stream of air or by immersion in a liquid bath, the glass is placed in a strained condition and is said to be tempered.

If tempered properly such glass is capable of resisting considerably more thermal and physical shock than annealed glass. It is placed on the market under a variety of trade names and is used in laboratory glassware, safety goggles, car windows, *etc.*, where physical and thermal shocks are likely to occur.

An examination of the strain conditions in tempered glass, will indicate, in general, how the glass is made resistant to thermal shock. To explain in detail the origin and conditions of strain in tempered glass is beyond the scope of this article. It will be sufficient to state that in tempered glass the entire surface region is in a state of compressional strain; the center is under tension, and between the center and the surface there is a neutral zone of isotropic strain.

When hot glass is suddenly cooled the outer region solidifies over an expanded hot central region. As the central region is cooled to room temperature by the cold surface, it cannot contract to its normal dimensions because of the solidified but expanded outer surface of the glass. This leaves the center under tension.

Remembering that in untempered glass fractures originate at surface flaws when the tension around the flaw exceeds the tensile strength of the glass, it is apparent that the state of strain introduced into the glass by tempering should increase its resistance to thermal shock. Before the tensional stress at the surface can exceed the tensile strength of the glass after tempering, it must counteract the compressional stress that has been introduced over the complete surface. Thus, a more severe shock is required to fracture tempered glass than untempered glass. When tempered glass does fracture indications show that the break often originates in the central tensional region.

Glass is most likely to break when it is plunged suddenly from a hot medium into a cold medium. In heating untempered glass from room temperature to a much higher temperature (cold to hot thermal shock), the surface is placed in a state of temporary compressional strain. Thus there is little chance of a break originating under this condition. But, when glass is cooled rapidly from a high temperature to a low temperature, the surface is placed in a state of temporary tensional strain and a fracture is likely to occur.

Condenser Lenses

Condenser lenses of projection machines are almost constantly subjected to thermal shock of this latter type. Their fracture is a familiar and frequent occurrence, and therefore the lenses serve as excellent examples for the application of the aforementioned principles.

Properly annealed condenser lenses of the highest illuminating efficiency, even when made of the best thermal shock-resistant glass, have a very brief life when used with high-intensity arcs. This is due to the tremendous thermal shock to which the lenses are subjected.

Only a few inches from the plano side of the condenser is a carbon arc carrying, perhaps, 175 amperes which acts as a source of heat. While this side of the lens is held at a high temperature, the opposite side radiates the heat and has a considerably lower temperature. The result is a thermal gradient that may cause fracture. Ordinarily optical crown glass would last only a few minutes under these conditions. Even well-annealed Pyrex glass with a much lower coefficient of expansion fails to withstand such thermal shock for a reasonable length of time.

A solution to the problem is found in fused silica, often referred to as fused quartz, with one-seventh the coefficient of expansion of Pyrex. Fused silica is expensive to prepare, but serves satisfactorily until the surface becomes pitted from the arc.

A lens made of glass having a low coefficient of expansion, such as Pyrex, will also last until the surface becomes pitted if it is tempered properly. However, the life of a tempered lens is limited by the temperature to which the surface near the arc is heated. When used with a high-intensity arc the tempered lenses will eventually break.

A comparison of the strain pattern in a condenser lens after tempering and again after 50 hours' use in a motion picture projector, using a 175-ampere arc, reveals a rather startling phenomenon: the lens appears to have more strain after use than before. Figure 1 illustrates this difference: (*a*) is a photograph of the strain pattern of a tempered condenser lens in plane polarized light before subjected to the aforementioned treatment; (*b*) shows the lens after use. The additional dark bands indicate the change in the amount of resultant strain.

From the analysis of the method of introducing strain into glass it may be concluded that no strain has been added, because the glass temperature did not reach the annealing range and it received a gradual chilling in cooling to normal, whereas it originally received a severe chilling.

The solution to this problem is found in the manner by which the lens is heated in the projector. The plano side of the condenser lens is usually placed only a few inches from the carbon arc source. Carbon arcs drawing a high current act as a source of considerable heat that raises the temperature of the plano side of the condenser thus decreasing the viscosity of the glass and permitting the gradual release of the surface layers of strain. This is shown in Figure 2.

A strip of glass 4 inches long, ¾ inch wide and ½ inch thick was air tempered. Figure 2 (*a*) shows the strain pattern in the strip as a result of cooling uniformly on the upper and lower sides. Considerable heat was then applied to the lower side of strip (*a*). Figure 2 (*b*), (*c*), and (*d*) show the gradual release of strain as the heat was applied for successively increasing lengths of time.

The arrow marks the neutral line of zero resultant stress. The decrease in

Manpower Situation Discussed at N. Y. State Projectionists' Meeting

THE manpower situation as it affects the craft was the chief topic of discussion at the New York State Association of Motion Picture Projectionists' meeting recently held in Syracuse, N. Y. President Glenn Humphrey called the attention of the delegates present to the suggestions made by himself and others at the Tenth District Convention that stage employees and relatives of such employees (brothers and sons) be made War Service Card workers so that they may pinch-hit for the duration for those I. A. men now in service.

The danger of breaking down safety projection room standards was discussed at great length and the delegates were warned to guard against such a possibility. Many excellent suggestions were submitted by the delegates covering various related problems.

INTERNATIONAL PROJECTIONIST was cited for the splendid work it was doing in furthering the interests of the craft and William Nagengast, delegate from Local No. 640, Nassau County, made a motion that each local union subscribe 100% to the publication. The motion was seconded by delegate George Doss, Local No. 376, Syracuse, and unanimously carried.

Among those present at the meeting were I. A. vice-president James Brennan; I. A. representative Joseph Basson; Charles F. Wheeler, Local No. 108, Geneva; Tom Brogan, Local No. 119, Auburn; Fred Boekhout, Cal Bornkessel and Louis B. Goler, Local No. 253, Rochester; Glenn H. Humphrey, George Doss, Raymond Roe and Lionel B. Wilcox, Local No. 376, Syracuse; Ralph Hayes, Local No. 338, Watertown; Denis F. Harrington, Local No. 592, Saratoga Springs; Wm. Nagengast, Local No. 640, Nassau County, and Earl J. Amo of Local No. 745, Malone.

P. A. McGuire, of National-Simplex-Bludworth, was one of the invited guests and spoke on several topics of interest to the delegates.

The evening session closed after a motion was made by delegate Boekhout and unanimously carried out that the Syracuse Local be accorded a standing vote of thanks for its hospitality.

DeVRY RELEASES PROJECTOR PATENTS FOR DURATION

Coincident with the celebration of the thirtieth anniversary of its founding, and the sixty-seventh birthday anniversary of the late Dr. Herman DeVry, its founder, the DeVry Corporation of Chicago announces the conclusion of arrangements whereby several of its patented projector mechanisms are released for manufacture for the armed forces.

W. C. DeVry, president of the organization, explains the action in the fact that the U. S. Army, Navy and the British Admiralty need patented DeVry equipment in larger quantities and at a rate of production in excess of one company's capacity to produce. Rather than expand its own facilities at the expense of time, critical machinery, and government funds, DeVry released its patents to sub-contractors royalty-free for the duration.

The DeVry company also is celebrating the award of a white star for its Army-Navy "E" pennant, indicating continued excellence in producing motion picture sound equipment and electronic training devices.

(*Continued from page 8*)

the number of dark bands between the neutral line and the surface gives a measure of the decrease in the compressional strain on the surface of the glass. Considerably more strain was released on the side heated owing to the lower viscosity of the glass in that region. Because the temperature in a condenser lens varies from a high value on the plano side to a low value on the convex side, more strain should be released on the plano side. The center and convex side of the lens tend to remain in tensional and compressional states of strain as limited by the viscosity of the glass which will vary according to the heat distribution.

The strain pattern in the lens following exposure to a high temperature for some time gives indications of considerably more strain. Previously, the strain viewed in the polariscope was made up of compression on the convex side, minus tension in the central region, plus compression on the plano surface which, in the usual methods of tempering thick lenses, will add up to resultant tension. This tension is indicated in the polariscope by a series of colored bands.

After use the strain pattern is made up of compression on the convex side, minus tension in the central region, plus less compression than previously on the plano side. This gives a greater resultant tension which is indicated in the lens by an increase in the number of colored bands (Figure 1). Actually, there is less strain in the lens, and also a less effective distribution of the remaining strain.

Over a period of time the compressional strain on the plano side will be released sufficiently to permit the surface flaws to enter a state of tension and cause a fracture. To counteract this release of strain special tempering techniques have been and are being developed to place a thicker layer of compression on the glass surface.

Although tempered glass will not endure indefinitely under severe thermal shock, tempering must be considered as a useful method of increasing the resistance of glass to thermal shock. One of the best examples of its usefulness is found in condenser lenses. Whereas annealed condensers under severe thermal shock in motion picture projectors will last only a few hours, the tempered condensers will last until the surface becomes pitted.

(a)
(b)
(c)
(d)

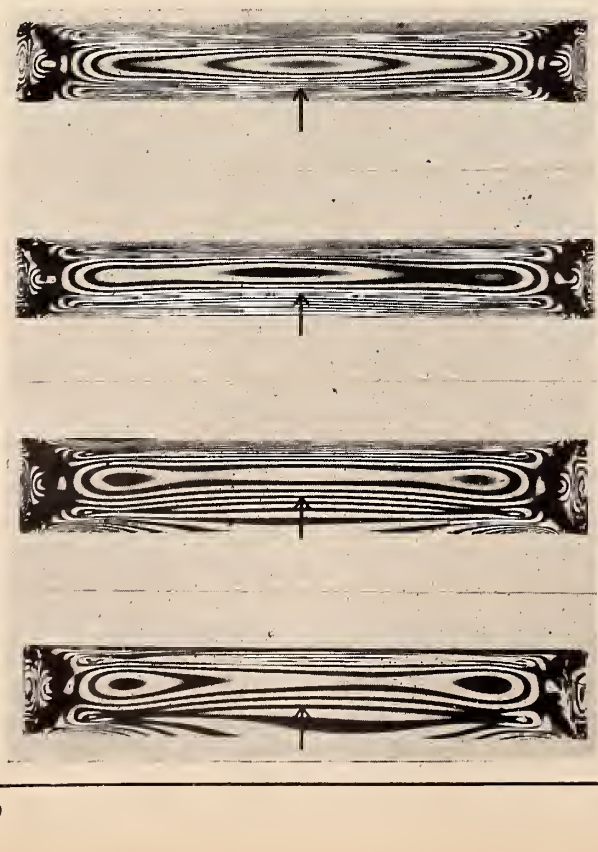


FIGURE 2

(a) Polariscope strain pattern in a glass strip tempered symmetrically from top and bottom with air. (b), (c), and (d). The same strip after successively increasing periods of heat application to the lower surface. The arrows indicate the neutral band of zero resultant stress. The outside of the glass is under resultant compressional strain and the inside under resultant tensional strain. The decrease in the number of neutral bands between the neutral layer and the lower surface shows that the heat treatment has progressively relieved the compressional stresses in this region.

Analyzing Power Unit Diagrams

By *LEROY CHADBOURNE*

THE CIRCUIT shown in Figure 1 can be regarded quite correctly as composed of twenty separate, comparatively simple circuits. Treating the schematic in that way not only makes it easier to analyze, but saves time and labor when the diagram is used in dealing with an emergency. If, for example, trouble should be confined to the current supply provided for an exciter lamp through the output terminals at center, left, not more than two of the twenty circuits shown in Figure 1 would have to be traced.

The output terminals in question might, in such a case, be traced as far back as the 22-ohm resistor, R-1. The voltage drop across R-1 could be regarded as the source of a circuit for which those terminals, and equipment connected to them, constitute the load. A voltmeter reading taken across R-1 would show if the trouble were in that "circuit"—there would have to be, if the voltage across R-1 were normal.

If that voltage is not normal, trace right from the top of R-1 through two choke coils to a point of junction with a vertical line. From the bottom of R-1 trace right to another joint of junction with a vertical line. These two junction points can correctly be regarded as the source terminals of a circuit of which R-1 is the load; a circuit in which there are two choke coils in series, and two condensers and a signal lamp in parallel. This circuit may contain the cause of the trouble if voltage across R-1 is incorrect, but all other output currents drawn from this unit are correct.

However, an abnormal voltage reading across R-1 might be the result of a short existing in the circuit between R-1 and the output terminals, or in the load connected to the output terminals. That circuit can be isolated by disconnecting the two wires that lead leftward from R-1, in which case the voltage of R-1 may return to normal, clearly indicating that the difficulty sought is in the output circuit or in the load.

On the other hand, if disconnecting the output circuit from R-1 does not result in a return to normal in R-1's voltage, then the circuit between R-1 and the connection points mentioned above would have to be checked. There *must* be trouble there if all the rest of this equipment is functioning normally. When it has been found and corrected, however, the output circuit leading leftward from R-1 must still be checked, because the trouble may have been caused originally by a short there.

In all of the foregoing only two of the twenty circuits of Figure 1 have required the least attention. The rest of the diagram has been ignored completely. There was not the slightest need to refer to it.

However, if all three left-hand outputs of Figure 1 performed faultily, some circuit common to all of them might be blamed. That circuit should then be investigated and the ones just traced dis-

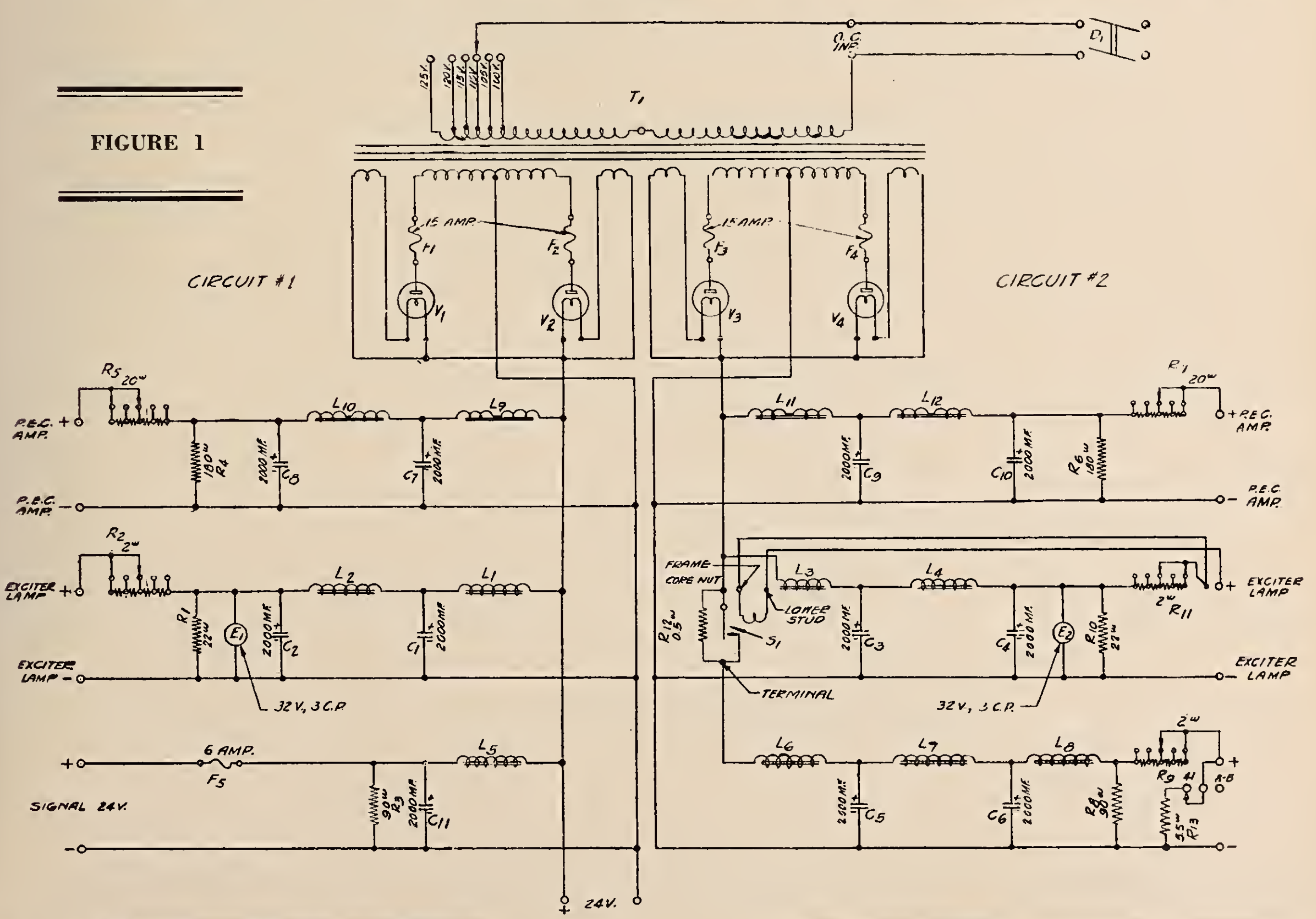
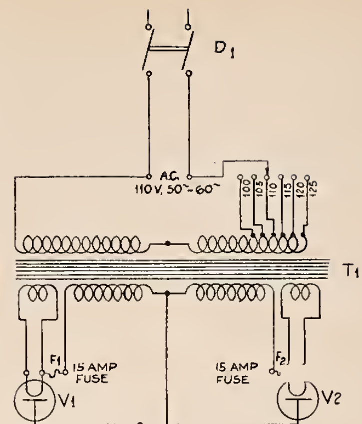


FIGURE 1

regarded. There could not possibly be any fault in this apparatus that would require tracing in detail all of its twenty circuits. The projectionist will save much time in fixing trouble by concentrating on those circuits of the diagram which are implicated by the trouble symptoms.

But the projectionist should *know* all the circuits of the diagram, not in detail necessarily, but accurately enough so that when trouble appears he can go to work at once on the particular circuits involved, and not have to take time out to unravel the basic nature of the diagram. Thus, it is not of the least importance to know in advance that R-1 is 22 ohms, or even that it exists. But it is very important to be able to remember, after a short glance at the circuit, that the three left-hand output lines all go back to a single power source; and the three right-hand output lines all go back to another power source. So much must be known, or readily remembered, in order that the projectionist may be able to interpret his trouble symptoms correctly and know what detailed circuits to investigate.

For example, if this whole unit fails to function there is only one circuit in it that can possibly be at fault—there is only one circuit that is common to the whole unit. This is the circuit that carries a.c. to the primary of the power transformer. It is shown at the top of the drawing. The terminals just right of switch D-1 may be regarded as its source and the primary of T-1 as its load.



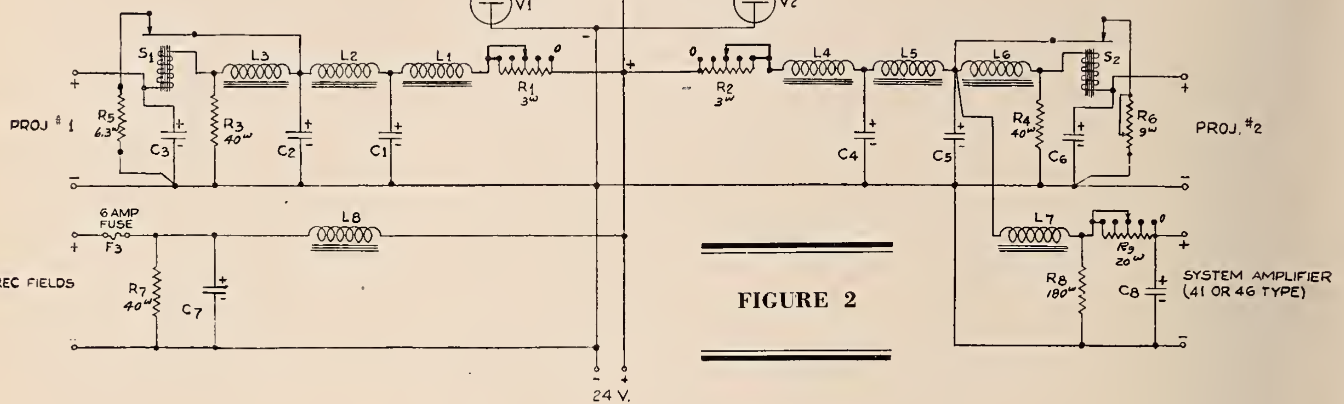


FIGURE 2

Two Complete Units

Beginning at the secondaries of the power transformer, there are two complete and entirely independent power units in this single piece of apparatus. The three left-hand secondaries supply the three left-hand output lines and the 24-volt output line at the bottom of the drawing; the three right-hand secondaries supply the three right-hand output lines. There are four filament circuits, the source of each being a secondary winding and the load of each the filament of one tube.

Four "bus" lines run vertically down the center of the drawing. The two at the left can be most conveniently picked up at the bottom, center, where they terminate at two posts marked +24V.—. Trace the positive line upward to the filament of V-2. A branch runs left to the filament of V-1. Trace from the filament of either tube to its plate, thence upward to either end terminal of left-hand plate secondary of the power transformer. These terminals constitute the positive side of the left-hand plate circuit. From the negative 24-volt output terminal at the bottom of the drawing, trace up, left and up to the center point of the same plate secondary. This is the negative side of the left-hand plate circuit. The secondary may be regarded as the source of that circuit, supplying (through the tubes) the two left-hand distribution lines, to which in turn a number of loads are connected in parallel.

At top left, R-4 may be considered one of those loads. It connects to its source, the distribution lines, through two choke coils which are in series with this circuit, and there are two condensers in parallel.

R-4, in turn, may be regarded as the source of the upper left-hand output circuit, in which R-5 is a series resistor.

The two circuits just below, centering about R-1, have already been traced. At bottom, left, R-3 may be regarded as the load across the distribution lines, and at the same time as the source of voltage for the 24-volt filtered signal output.

The arrangements of the right-hand half of Figure 1 are nearly identical with those just traced. A few minor differences may be worth examining.

At the central output circuit—an exciter lamp supply—trace from the right-hand end of R-11 up and left to a magnetic winding forming part of the relay switch, S-1, and thence right to the positive output terminal. While this circuit functions normally, the magnetic winding keeps S-1 switch contacts closed. If current declines and if the exciter lamp burns out or is switched off, the magnetic winding releases S-1, which then automatically opens.

S-1's contacts are in series with the lower output circuit, supplying an amplifier. When S-1 opens, R-12 is in series with this lower circuit, reducing its voltage. With S-1 closed, R-12 is short circuited and inoperative.

Reason for Arrangement

The reason for this arrangement is that both of these right-hand output circuits are powered by the same rectifier, and with the exciter lamp load disconnected the voltage to the amplifier might become too high. The arrangement just traced automatically introduces the resistance of R-12 in series with the amplifier supply whenever the drain of the exciter lamp is removed for any reason whatever.

In the lower output line, to the amplifier, there is a resistor, R-8, which can be regarded as the source of the voltage supply to the amplifier. R-13 may be thought of as in parallel to the line. On the other hand, R-8 may be considered the source of a circuit in which R-13 is the load, and R-13 in turn may be taken as the source of the amplifier voltage. In that case, Figure 1 could be said to contain 21 circuits, instead of 20. As matter of fact, all the filter condensers in parallel with these various lines could be thought of in the same way as R-1—as loads upon a source, and in turn the

source of voltage for the remainder of the line in question. Treating the diagram in that way would introduce eleven additional "circuits" into Figure 1. And, depending on the type of trouble to be investigated or the nature of other work to be done on this apparatus, it may or it may not be highly convenient to break the diagram down into these additional circuits.

The important point is to have a good general idea of the whole electrical structure of the apparatus, and in time of trouble to pick out those distribution points and those loads which constitute the most convenient "circuit" for the particular work to be done.

Circuits of Figure 2

The a.c. input circuit to Figure 2 is seen at the top of the drawing, with terminals above D-1, its source terminals, the transformer primary the load. There are two independent filament circuits, in each of which a transformer winding is the source, a filament the load.

For the plate circuit it is very convenient to start at the bottom of the drawing, at the 24-volt output terminals. Trace the positive line straight up to the center-tap of the plate secondary. Trace the negative line up through the tubes to either end of the plate secondary. The source may be regarded as either half of the plate secondary, whichever half is working at a given moment—that is, whichever half is more negative than the center-tap. The tubes are in series with the line. Several branch loads are connected to the source through the "bus bars" that run vertically down the center of the drawing.

At top left, the circuit from the bus bars may be thought of as terminating in R-3, with two condensers across the line, and three choke coils and R-1 in series with the line. R-3 can then be thought of as the source of the voltage which is delivered to Projector No. 1 output terminals and to whatever load these terminals supply.

When there is no load, R-5 automatically becomes the load. In this way: S-1 is a magnetic winding in series with the output circuit; while normal current is flowing S-1 holds down the bar of the switch drawn just above it and R-5 is open-circuited. When the output circuit is opened for any reason, or draws too little current, S-1 releases the contact bar, closing the connection to R-5. R-5 thus may be considered the load of a separate circuit, the switch for which is S-1, and the source for which is the vertical bus bars.

The lower left-hand output arrangements are straightforward; the right-hand side of the drawing is a trifle more complicated. There are two loads connected across the source in parallel, R-4 and R-8. L-7 is in series with R-8, but not with R-4. In this case it might prove helpful to regard C-5 as the load imposed on the bus bars, even though it carries no current except an a.c. ripple. Then R-8 can be considered one load connected across C-5, with L-7 in series. R-4 is a parallel load connected across C-5, with L-6 in series. The wiring beyond R-4 is practically identical with that beyond R-3 on the other side of the drawing; the only difference is that R-6 is adjustable whereas R-5 was not. The output arrangements beyond R-8 need no further comment.

Reflected Troubles

Unlike Figure 1, Figure 2 does not consist of a double power unit in one case, but is a single power unit; hence if there is any trouble in the rectifier *all* of the output circuits will reflect it. However, if the trouble consists of hum, it will manifest itself in different degrees in the different output circuits, according to the amount of filtering in each and the nature of the load each serves. Trouble that is found only in some output circuits (while others continue to perform perfectly) cannot possibly be in the rectifier. But it is very evident that trouble in both right-hand output circuits might have its source, for example, in R-2, or in L-4, or in C-4 or C-5. Trouble that affects both left-hand output circuits may be "reflected" trouble, in the sense that a partial short through C-7, for instance, might result in lowered voltage across R-3. But in that event the voltage across the right-hand output circuits would also decline.

With a good general knowledge of the arrangements of Figure 2 trouble symptoms can be interpreted to the point where the projectionist can proceed to investigate one circuit at a time, beginning with the one most likely to be at fault, and ignoring the rest of the apparatus until that one circuit is proved blameless. However, it must be remembered that in Figure 2 troubles can be reflected anywhere, inasmuch as all outputs are connected ultimately across one set of bus bars; and a short in any output circuit, or in the load connected to it, will affect every part of this drawing. A trouble found to exist in all the output lines does not necessarily mean that the rectifier is at fault. The fastest procedure, in such case, might be to disconnect all output circuits except one from the bus bars. If that one then functions well (taking into account that its voltage will be high because much of the drain on the rectifier has been removed) reconnect the other output lines one at a time until the faulty one is found. If results are not improved, disconnect the one circuit (that may be the one at fault) and instead connect one of the other loads. If the trouble still persists, the rectifier must be investigated.

Boston WLB Penalizes Circuit for Wage Cuts

THE regional War Labor Board of Boston rendered a decision, the first of its kind, in favor of Local No. 182, Boston in its fight against the Allied Amusements, Inc., operated by the E. M. Loew interests. Economic sanctions, the first in New England, were recommended by the New England War Labor Board against the theatre circuit which was found to have cut the salaries of motion picture projectionists employed at one of their theatres from $83 to $55 a week during June and July in violation of the stabilization rules. The decision of the War Labor Board, announced by Allen A. Tepper, regional attorney, states in part:

"We find that the Allied Amusements, Inc., in decreasing the $83 salary rate for the motion picture projectionist's classification, violated the provisions of Public Law # 729 and the Orders and Regulations issued thereunder.

"We find that, in the period from June 6, 1943 to July 31, 1943, Allied Amusements, Inc. paid the motion picture projectionists employed by it at the Majestic Theatre in violation of the provisions of Public Law # 729 and of the Orders and Regulations issued thereunder.

"We find that the total salaries paid to the motion picture projectionists employed by Allied Amusements, Inc., at the Majestic Theatre in the period beginning June 6, 1943 and ending July 31, 1943, amounted to $1736.40, and that such amount of $1736.40 is the amount in which penalties are to be applied against Allied Amusements, Inc."

Thad C. Barrows, president, and James F. Burke, business agent, represented Local No. 182 at the many hearings before the War Labor Board.

CRESCENT SIGNS FOR ADDITIONAL ALTEC SERVICE

The Crescent Amusement Company, Nashville, Tenn., has added Altec Service's booth repair-replacement parts division to the Altec Service agreement for sixty-two Crescent amusement houses in Tennessee, Kentucky and Alabama.

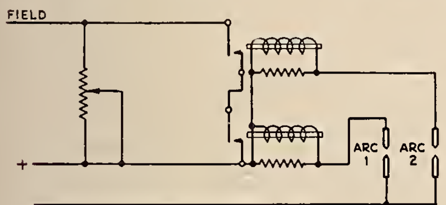
AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Improving Arc Lamp Regulation

In old arc generator installations, poor light at changeover time is often due to common wiring, etc., causing voltage drop. These effects may automatically be corrected by energizing a relay across each ballast rheostat and using the relay contacts to short out a selected part of the field rheostat. The relay contacts are connected in series with each other. The total is connected across the field rheostat.

To set up for good operation, adjust the arc ballasts for desired amperage with the field rheostat and the generator set to give at least 10 volts less than



maximum. Thus, when both arcs are on and the relays act to cut out the field rheostat, the extra 10 volts will overcome the line losses and maintain the arcs at normal voltage. It works fine, and so far as I know, has not been used elsewhere.—Frank Adams, *RCA*.

New Film Stock

The new film stock now used by the studios, in their film conservation effort, has been found to shrink on subsequent runs. Perhaps this is due to the stretching by take-ups on some equipment. This warping of film causes a weave and one of the remedies is to reduce the tension of the lateral guide roller against the drum. The projectionist should be instructed to reduce the size of the loop between the projector and the soundhead. Tightening of the flange spring will not help as it would only cause the thin film stock to buckle.—C. Schwander, *RCA*.

Improving Take-up Operation

Excessively tight take-up tensions probably are the cause of more film damage than any other single item. Take-ups found to be too tight are often defended on the grounds that they are too loose at the start and tighten up as the reel proceeds. The writer has often taken cases like this and urged that the entire assembly be taken apart. Upon inspection it is found that the trouble is due to a dry and dirty leather, maybe one of uneven thickness, or a scored shaft journal or bearing. Many new projectionists are unaware of the oil hole in the take-up as it is obscured by the spider wheel.

This trouble may be completely eliminated by dressing the shaft journal, if scored, with crocus paper and steel wool and applying crocus paper to the bearings. Oil the bearings, making sure that the set screw fits one of the holes provided for it. Replace the leather of the take-up belt with soft leather, which may be obtained from a local shoemaker, coating both sides with a generous application of vaseline. See that the belt is not too oily, too loose or too tight. Make certain that the reels used do not rub the inside of the magazine. This procedure followed by the writer over a period of years, has never failed.—A. F. Schneider, *RCA*.

Correcting Guide Roller Trouble

In cases of trouble with lateral guide rollers not turning in the PS-20, and similar type soundheads, the trouble can be stopped in almost every instance if the projectionist would allow more slack between the picture head and the soundhead. Most of the above equipment is located in theatres in small towns where there is quite a turnover of projectionists due to present-day conditions, and it seems to be a habit of inexperienced projectionists not to allow sufficient slack at this point.—K. E. Stephenson, *RCA*.

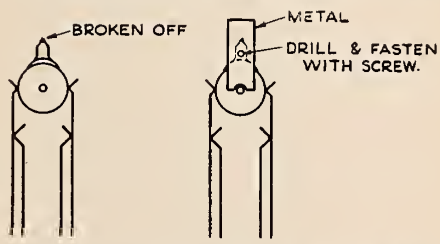
Simple Method of Impedance Matching

Excite the photo-electric cell with a lamp bulb, then with an output meter across the output transformer without load, set the meter on some voltage scale, making sure that the amplifier is not overloaded. After noting the voltage reading, with meter still connected hook up the speaker load. If the match is perfect the reading will drop to one half. However, this applies only to 120 cycles as reproduced from the light bulb. This would result in an overmatch at lower frequency, so the meter should not drop to quite one-half the voltage at 120 cycles.

The monitor should also be taken into consideration. The monitor should be in operation when these readings are taken and should be at full volume or at the regular setting. This is where the monitor is driven direct from the output transformer without the monitor amplifier; with the monitor amplifier, the monitor can be left out for all practical purposes. —H. D. Graves, *RCA*.

Repairing Fader Switches

The keys in fader switches and similar equipment that have broken handles can be repaired by using a piece of metal



with a notch cut in one end to enable it to slip over the bearings. Drill a hole through the metal and the round part of the key still remaining. Bolt the two together with a screw.—C. W. Schwander, *RCA*.

Correcting Film Buzz

In a number of cases where trouble appeared in the form of a buzz due to film weave and the usual check of the soundhead revealed nothing, a further check showed that the soundhead was out of line with the projector head. This cannot be observed unless the gear and rotary stabilizer guard on the left side of the machine are removed.

A couple of long positive super X carbons, one held flat on the texalite gear and the other on the steel gear which drives it, and both extending to the front will show accurately if the gears are in line. If not, the soundhead and projector head are out of line and this puts an uneven pull on the film. This condition often occurs when a new projector head is installed by someone who does not appreciate the importance of alignment between the two heads.—H. E. Graves, *RCA*.

IN THE SPOTLIGHT

By *HARRY SHERMAN*

BEFORE us today on the European stage there is being enacted the great tragedy of intolerance, and indeed we have cause to be happy in the good fortune which is ours in that this country has escaped the ravages of war that have befallen almost every European country. For which let us approach the coming Yuletide with prayers in our hearts for an early victory and for the safe return of our loved ones from the scenes of combat. We extend our very best wishes to all our readers for a Merry Christmas and a Happy and Victorious 1944.

● Thank you, Daniel Nulty, for responding so quickly to the request of Ed Whitford, Local 376, Syracuse, which appeared in our last issue, for information on the non-intermittent projector. Nulty, member of Local No. 306, New York City, lost no time in contacting this office after reading the query and was very happy to help a brother member out of a quandry. The information was immediately passed on to Whitford and we hope it answers all his questions.

● Pvt. Herman Newman, member of Local No. 143, St. Louis, Mo., teaches projection to the army recruits in California. Despite the much ballyhooed climate of "God's country," Herman longs for the day when he can shake the California dust off his shoes and trek back home to St. Louis.

● A piece of ignited film started a fire in the projection room of the Gregory Theatre, in Gregory, South Dakota, and resulted in the death of projectionist J. W. Hancer who fought the blaze in an attempt to prevent it from spreading to the theatre auditorium. This could happen in your projection room and you may be called upon to risk your life so that other lives in the theatre might be spared. What are you and your union officials doing to prevent such an occurrence?

With a two-man shift in every projection room the danger from fire will be greatly minimized — but Mr. Exhibitor will have to be educated along those lines. He understands best the universal language of DO-RE-MI, and if he can be convinced that the extra cost of maintaining a two-man shift will more than compensate him for that extra measure of insurance against damage by fire, he may see the light. These "thrifty" exhibitors depend too much upon fire extinguishers and other fire fighting paraphernalia. The projection room at the Gregory Theatre was also equipped with a fire extinguisher and Hancer used it —but *Hancer died.*

● An increase of $2.50 and $3.00 per week has been granted to the members of Local No. 671, Canton, Ohio. This increase, retroactive to September first, has been approved by the regional War Labor Board. Score another victory!

● An important precedent was set by the Appellate Division of the New York Supreme Court when it upheld Local No. 306 in its claim that a union contract with a theatre applies to other theatres acquired by the same owner. The case at issue was that of an independent circuit that acquired a new theatre after a circuit contract had been signed with Local 306. The circuit contended that the union contract did not apply to the new theatre and, refusing to arbitrate with the local, it immediately cut the salaries of the projectionists employed there.

The court was unanimous in its decision that the circuit was bound by the contract for *all* its theatres—whether acquired before or after the signing of the contract—and ordered the circuit to arbitrate a wage cut in accordance with the union contract.

● Being a Past Master of the Masons, we naturally are interested in the Masonic activities of other I. A. members. Meridian Lodge No. 610, Cleveland, Ohio, recently held its thirty-third installation of officers, many of whom are members of I. A. Local No. 160, to wit: Harold J. Thomas, *Worshipful Master*; Owen F. Fowler, *Junior Warden*; Charles F. Arndt (Past Master) *Treasurer*; Victor A. Welman (Past Master) *Secretary*; H. Byron Liebler, *Senior Deacon*; Harry N. Upson, *Junior Deacon*; Warren S. Covell, *Senior Steward*, and Charles O. Noe (Past Master) *Marshal.*

● Bill Kunzman, of National Carbon Company, is planning a tour of the Southern states and looks forward to renewing acquaintanceship with his many friends in the various I. A. Local Unions. He has known many of these men for a good number of years, and although it is about 12 years since he last visited many of these Locals, he has retained their friendship.

Bill has a message for the boys on the salvaging of copper and other projection room problems, and we know that he will be accorded all the courtesies due him—not only because he is one of National's most popular representatives but because he has always proven himself to be a good friend to organized labor.

● The two Lyday boys—George W. and Arthur H., sons of Arthur W. Lyday, business representative of Local No. 194, Indianapolis, Ind., are members of Uncle Sam's armed forces. George W. took part in the African campaign and from last reports he is still there and apparently okay. Arthur H. is at present stationed at San Diego, Calif., and expects to see active service very shortly. Both boys are members of the I. A., and their dad is plenty proud of them.

● We notice in the trade press that the Chicago exhibitors are continuing with the boosting of admission prices. One theatre, for instance, raised its price of admission from 22c to 28c, another from 15c to 22c, a third from 50c to 60c—but what's the use, we could go on indefinitely quoting these raises but our space is limited.

At first glance these increases may appear to be of little consequence, but when you multiply them by the several hundred customers that daily patronize

the average motion picture theatre, you will have a fairly good idea of what a whale of a difference it makes at the box office. Yet the fellow in the projection room—the guy who helps bring these extra shekels into the box office till—he must get the approval of government agencies before he may get an increase in salary, no matter how slight. But the exhibitor needs no approval from any agency to raise his admission prices. Does that make sense?

● Arthur E. Meyer, of National-Simplex-Bludworth, has returned to his office from an extended tour throughout the country. Meyer visited many I. A. Locals where he played host to his projectionist friends. He brought us back messages from many of the boys—to name a few — Charlie Bell, Charlie Hathaway, Red Rupard, Harvey Hill and Jim McNabb. Thanks, boys, for your kind wishes, and thank you, Arthur, for conveying the messages.

● Congratulations to Gil Light, former vice-president of Local No. 199, Detroit, Mich., on the recent marriage of his daughter. Gil served in World War I, and the fighting tradition of the family will now be carried on by his new son-in-law who is a sergeant in the army. Our best wishes, of course, go to the young couple.

● Russell Ruben, son of the late Max Ruben (business agent of Local No. 199, Detroit, Mich., for a number of years prior to his death) was a recent visitor to the offices of I. P. Young Ruben, now a sergeant in the army, looks remarkably like his late father in his younger days—walks and talks like him—he even has all of Max's mannerisms. Seeing Russell brought back many memories.

● One of our contemporaries raised his voice recently in protest against the poor screen fare given our men at the various fighting fronts. Kaspar Monahan, editor of the "Show Shops" column for the Pittsburgh Press writes as follows:

"One of the reasons given for poor screen shows for the service men at the fronts is that equipment is poor and the projectionists are inexperienced. In that case you'd think the armed services would be eager to accept enlistments from experienced motion picture projectionists.

"But a local projectionist, 37 years old and with over 20 years' experience, tells me that he has tried in vain for over a year to enter the army and do the job he knows best that of running a movie projector and taking care of his equipment. For his pains all he has is a tall stack of correspondence."

Well, we can go Monahan one better. Twelve men from a certain local enlisted in the army with the understanding that after their basic training period they would be made sergeants and their duties would be confined to the projection of motion pictures. After the training period was over, however, several of these men was assigned as cooks and the rest to other branches of service for which they were not fitted either by training or by temperament. This must be a new method of keeping up soldier morale!

● Herbert Nayman, 36 years old, member of Local No. 173, Toronto, Canada, died last month from injuries sustained in a three-alarm fire which broke out in the Film Exchange Building in Toronto, Canada. Nayman, and his assistant Jack Schilling, also a member of Local 173, were trapped in the projection room on the fourth floor of the building where they were preparing for a screening that evening. Schilling managed to escape safely but Nayman had to be rescued by firemen. Although when he was admitted to the hospital, Nayman's injuries were not considered serious, but took a turn for the worse the next morning and died shortly thereafter.

Although the cause of the fire has not yet been determined, we cannot help but feel that if the projection room had been given the same measure of protection that was given the fireproof vaults where thousands of reels of film were stored and saved, Nayman would not have died. Yes, the film company officials are getting up a fund to take care of his wife and two small children. How generous of them! How much better it would have been if they had spent a little thought and money in making the projection room a safer place in which to work.

● Thad C. Barrows, president, and James F. Burke, business agent, respectively, of Local No. 182, Boston, Mass., won a signal victory over the Allied Amusements, Inc., controlled by the E. M. Loew interests. This is the first defeat suffered by the E. M. Loew circuit and Messrs. Barrows and Burke are to be congratulated.

Last June the Allied Amusements cut the salaries of projectionist employees, members of Local 182, without first obtaining the approval of the National War Labor Board, a violation of Public Law 729 of the 77th Congress and of the Orders and regulations promulgated thereunder. Barrows and Burke immediately filed charges with the Regional War Labor Board against the circuit and after due deliberations a ruling in favor of the local was handed down. The E. M. Loew circuit was ordered to pay the 13 projectionists involved in this case back salaries amounting to $1756.40. Much credit is due Allen A. Tepper, attorney for the Regional Board, for his fairness in the case. LABOR OMNIA VINCIT.

● Corporal Adam Miller, member of Local No. 541, Elyria, Ohio, and now of the 1560th Service Unit of Camp Atterbury, Indiana, replied to our query regarding a fire which broke out in the theatre at his camp. Although the fire started backstage, Miller was trapped in the projection room while trying to save the precious equipment. Before jumping to safety from the projection room window, he closed the porthole and removed the film from the machine. If he had not been so concientious, and had left the theatre as soon as the fire broke out, he would have escaped unscathed instead of winding up with burns on his face and lacerations on the knee. Guess he did what any other I. A. man would have done under similar circumstances.

● Our deepest sympathies go forth to Albert E. Lorentz, Sr., member of Local No. 171, Pittsburgh, Penna., on the loss of his son, Private First Class Albert E. Lorentz, Jr., who died in North Africa several months ago. Although Albert,

Albert E. Lorentz, Jr.

Jr., had been reported as missing in action, no definite word as to his whereabouts was received until recently.

Young Lorentz was inducted into the army in September 1941 and was sent to Ireland the following April. He landed in Africa in January of this year where he saw immediate action. Several months later he made the supreme sacrifice. Surviving him are his parents, a brother who is a corporal with the Tenth Division at Camp Gordon, Ga., and three sisters.

● I. P. received a very fine letter of appreciation from Local No. 511, Jacksonville, Fla., for responding to their request for certain information which was used in their argument before the War Labor Board for a 5% increase. It seems that the referee of this particular Board was a college professor who derided the

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TELEVISION TODAY

III—Significant Standards for Commercial Television

By *JAMES FRANK, JR.*

MANY requirements of a technical nature must be satisfied before television can occupy its destined place in the electronic arts. After having studied the first two installments of this series of articles describing Television Today, the first having informed the reader about the important electronic devices used in television, and the second explaining the theory of television, it is desirable to consider the more important of these requirements. In so doing the reader will be able to better appreciate the present status of the art as well as some of the obstacles that have had to be overcome and how television is really possible.

The National Television System Committee recommended to the Federal Communications Commission in March 1941 certain standards which were later adopted and are today in effect. An explanation about the more important of these is necessary to fully understand how television works.

As in motion pictures, the degree of technical perfection of the reproduced image may be measured in part by the detail it contains. To produce a system that will transmit and reproduce pictures of acceptable detail has been one of the most severe problems in the development of television.

The amount of detail that can be transmitted by a television system depends upon the number of picture elements resulting from the scanning process. The number of picture elements, then, depends upon the number of horizontal lines by which a complete picture is scanned. A picture element is substantially round and has a diameter equal to the distance between the centers of the adjacent scanning lines—that is, the scanning line pitch.

Rate of Scanning

As a yardstick in determining comparative definition, it is interesting to note that photographs reproduced in the better newspapers are made up of approximately 4000 picture elements per square inch. Rotogravure pictures of excellent quality may have as many as 10,000 picture elements per square inch.

As mentioned previously, there must always be a compromise between picture definition and equipment facilities. During the experimental stages of television the number of scanning lines (horizontal) per picture has been gradually increased as the apparatus was perfected. When television was first commercially introduced in 1940 a picture with 441 horizontal lines was used. Shortly thereafter when various groups in the industry created serious agitation for reconsideration of standards, a detailed study and analysis of all of the problems involved was made. One of the results of this action was a revised standard with respect to the number of scanning lines, which is specifically limited to black and white images as a different standard may be desirable for images in color.

At this time, therefore, the standard relating to scanning lines is as follows: *"The standard number of scanning lines per frame period in monochrome shall be 525, ..."*

Television images with 525 horizontal lines compare very favorably in quality with images of equal size projected from 16 mm. film. A photograph of an actual 525-line television picture is shown in Figure 5.

In television, as in motion pictures, two considerations are involved in determining the rate at which the scanning operation must be repeated. The rate of repetition must be great enough to give the appearance of reasonably continuous and natural motion in the reproduced scene, and must be great enough to minimize unsteadiness or flicker in the reproduced picture. Continuity of motion may be maintained with a repetition rate of 16 pictures or frames per second. This is the rate used in the days of the silent motion picture. At least 48 frames per second are required, however, to minimize flicker — unless some artifice be employed.

FIGURE 5
Photograph of an actual 525-line television picture

As explained in detail in the second installment (Nov. 1943 issue), persistence of vision is that characteristic of the human eye which causes a retinal image to remain for a short period of time after the actual image focused on the retina of the eye is changed. In other words, the human eye reacts comparatively slowly, so that if the images on the retina be changed with sufficient rapidity, an impression of continuously moving pictures is created.

Motion pictures are projected at the rate of 24 frames per second at the present time, and the artifice to reduce flicker, and also to solve certain mechanical problems, takes the form of an additional blade upon the projector shutter that interrupts the light while the film is being moved, or while one picture is being pulled down and the next one moved into place for projection. Thus, as far as flicker is concerned, the projection is in effect 48 frames per second, each still picture on the film being projected twice. The light is cut off twice by the two-blade shutter, once while the film is moving and once while it is standing still.

Such an artifice is not applicable in television. Some other method must be devised. Interlaced scanning is employed to provide satisfactory freedom from flicker. In this procedure, instead of scanning the picture in adjacent horizontal lines from top to bottom, alternate lines or every other line covering the entire area of the picture are first scanned, and then the beam returns and scans the omitted lines. The entire picture is scanned 30 times per second, but the picture area is covered in alternate lines 60 times per second. This arrangement is most desirable to eliminate flicker because it permits pick-up from motion picture film which must be run at the standard rate of speed to permit suitable reproduction of a standard sound track.

There is another requirement in television which affects the frame frequency. This is the relation that should exist between the frequency of the power supply to both the transmitter and the receiver and the repetition rate. It is desirable that the repetition rate be an integral divisor or multiple or sub-multi-

ple of the power line frequency. This is necessary in order to minimize certain non-synchronous interference effects, which otherwise might be detrimental to the picture.

Television transmitters and receivers are designed to operate in this country on a 60-cycle a.c. power supply. Thus, a frame frequency or repetition rate of 30 frames per second fulfills the requirement whereas 24 frames per second would not. This is the smallest submultiple of 60 the double of which is above the maximum flicker frequency observable by the eye (48 frames per second).

The standards now in effect relating to scanning specifications are more fully then:

The standard number of scanning lines per frame period in monochrome shall be 525. interlaced two to one.

The standard frame frequency shall be 30 per second, and the standard field frequency shall be 60 per second in monochrome.

It shall be standard, during the active scanning intervals, to scan the scene from left to right horizontally and from top to bottom vertically, at uniform velocities.

Transmission Data

The transmission electrically of high-definition images over a single channel, cable or radio, requires very wide frequency band apparatus and circuits. This is occasioned by the rate at which information must be transmitted relating to the brightness of a very large number of picture elements.

For example, a television image with an aspect ratio (the relationship of the length to height) of 4 to 3 will contain about 250.000 picture elements. This is determined by the square of the number of lines times the aspect ratio. For an image with 525 lines with equal horizontal and vertical resolution or detail there would be more picture elements than 250,000, but when the standard was changed from 441 to 525 lines it was recognized that to maintain the picture elements at about 250,000 there would be some sacrifice of horizontal resolution while fine vertical resolution has been preserved.

When 30 pictures per second are scanned, information must be transmitted concerning the brightness of 30 times about 250,000, or 7,500,000 picture elements per second. One cycle of the picture signal provides such information for two picture elements in interlaced scanning, so that about 3,750,000 elements per second must be transmitted. The total frequency band required for transmitting a picture as described above is about 4,000,000 cycles per second, or about 4 megacycles per second.

As a means of comparison, ordinary high quality speech transmission involves apparatus and circuits to accommodate a frequency band of not to exceed 10,000 cycles per second.

Four megacycles per second is the width of the frequency band, to accommodate the highest frequency television signal, that must be amplified and carried by the apparatus and circuits in the television system. It is that frequency band by which the carrier-wave or antenna current of the radio transmitter must be modulated. The total radio transmitting channel will be 8 megacycles per second when the carrier is modulated by the picture signal, 4 megacycles per second above the carrier and the same number below. This is equal to the combined widths of 800 sound broadcasting channels of 10,000 cycles per second each.

Channels of such great width are not available in the frequency spectrum or range now used for radio services. For this and other reasons related to technical requirements, the ultra-high frequencies, or ultra-short waves, are used for television. Frequencies above 30 megacycles, equivalent to below 10 meters (number of cycles per second times number of meters always equals 300,000,000) are employed.

Ultra-short waves have properties in propagation similar to optical waves. The range over which satisfactory high definition television pictures may be reliably transmitted by ultra-short waves is limited practically to the distance of the horizon from the height at which the transmitting antenna is placed. Under some abnormal conditions, pictures may be received over greater distances for periods of very short duration, but primarily television stations will serve local areas. The signals from the stations in these local areas will be stable and will have about the same intensity during the day and night hours and during all the seasons of the year.

The explanation of this relatively short distance of satisfactory transmission is that these very short radio waves are not reflected by the Heaviside layer. The Heaviside layer is a layer of air, filled with electrons and ionized gas molecules, which acts like a good reflector for electromagnetic radio waves. It is located about 100 miles from the earth's surface and its height changes with sunlight conditions. It is higher at night than in the day time.

Radio waves of the order of the regular broadcast band (550 to 1600 kilocycles per second) are reflected and may thus be transmitted over long distances, being reflected from the Heaviside layer to the earth and back a number of times. Television waves are not reflected by the Heaviside layer, so that only the direct waves are useful.

In order to economize on the use of the frequency band required, "vestigial side band" transmission is used. In this system, the partial elimination of one side band is achieved by the use of band-pass filters which have a range of partial transmission in the region on either side

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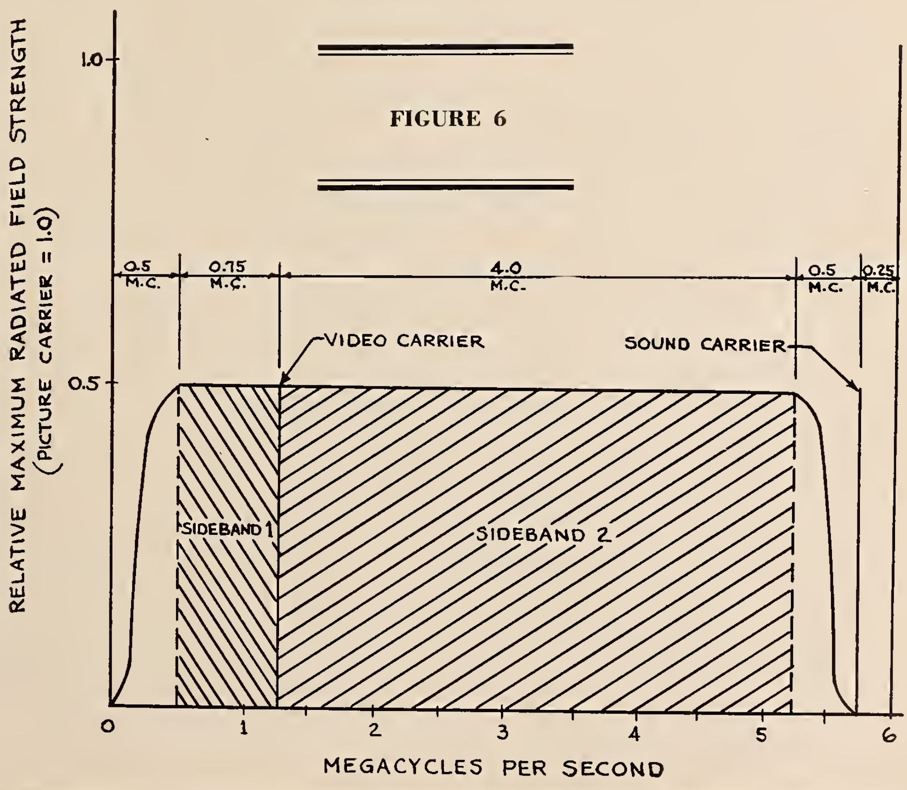

FIGURE 6

Application of Relays

THE relay has a wide range of application, including telephone equipment, aircraft, elevator control, motor starting, and numerous other power and speech uses. Basically a relay consists of an electromagnet and two or more contacts and may be likened to an electrically operated switch in contrast to the various types of manually operated knife, toggle, slide and rotary switches. When the electromagnet is energized, an armature is drawn toward the pole pieces of the magnet. The so-called moving contacts of the relay are actuated by this armature and so are repositioned to either open or close contacts either simultaneously or in the desired sequence. While all relays operate on this general principle, the class is usually divided into several types, which include solenoids and power and speech relays.

Why are relays used to perform what may be called an indirect function instead of using switches? There are many considerations which dictate the use of relays instead of switches. It may be the complexity of the switching involved, the currents and power to be controlled or the impracticability of locating a switch at the point where the actual control is to be established.

All that is needed to control a relay is a single pole single throw switch. The power necessary to actuate the relay is comparatively small when referred to the power which may be switched; hence, the switch may be small and compact and thus simplify the mounting problem. Furthermore, such a switch may be conveniently located and a pair of small wires run to the magnet of the relay. The distance between the switch and the relay does not present a problem since the power to be transmitted is small.

Two Types of Relays

We usually think of a relay as operating as soon as the circuit through the magnet is closed, but there are slow-acting and time-delay relays as well. One of the earliest ways of obtaining a slow acting relay was to slide a copper tube over the iron core. The eddy currents induced in this copper slowed up the action of the relay. Now there are thermal delay relays which perform the same function. When the circuit is closed, current passes through an auxiliary coil, which heats a bimetallic element. This element, functioning on the same principle as a thermostat, closes the circuit through the main coil and the relay operates. As soon as the relay operates the heating coil circuit is opened. The time delay is adjustable through a fairly wide time range in seconds. This type of relay is especially useful in power amplifiers which employ vacuum tubes that require careful heating of the filaments before the plate voltage is applied.

It is obvious that for such use one switch is closed, the filaments begin to heat at once and at a predetermined time interval the plate circuit is closed by the thermal delay relay. Previously a three-position switch was used and if the operator was impatient and did not leave the switch in "filament" position long enough tube life was shortened if the tube did not fail immediately. Mercury vapor rectifier tubes, in general, require preheating of the filaments, and these frequently fail if plate is applied too soon.

The considerations that dictate relay design are primarily an efficient magnetic structure to minimize the actuating power required, a carefully calculated coil for the purpose intended, carefully selected contacts as regards material, size and shape, moving spring elements that not only will carry the current, but give the necessary contact pressure without fatigue and distortion, and a suitable practical mounting. The mounting will, of course, vary greatly with the type of service, but it must be rugged enough so that the relay elements will not change their relation, one to another. There are relays for operation from d.c. or a.c. supplies and, naturally, the magnetic structure is different, but in each of these classes we find that the physical appearance is different for the numerous applications.

Springs or moving elements and contacts either make or ruin a relay no matter how carefully the other elements of design have been thought out. The best contacts will be made of some material that will not accumulate a high resistance film during the operations of make, break and circuit maintenance. Low contact resistance is particularly important in low voltage, high current circuits and also in speech circuits where both voltage and current may be low.

Silver is a good contact material, not forming dielectric oxides under conditions of heating by current flow or of arcing or as the result of atmospheric conditions. Transfer of metal takes place during arcing and to get around this problem and also the welding tendency under high current conditions such materials as cadmium oxide, cadmium sulphide, lead sulphide, tungsten and molybdenum have been added or considered for addition to the silver.

Frequent Inspection Essential

This transfer of metal results in the formation of a crater in one contact and cone on the other. Relays tend to stick under these conditions and the contact resistance tends to rise. Hence, it is essential that they be inspected frequently and at the first indication of such burning or pitting they should be carefully burnished with a point file. Be sure that the contact surfaces remain parallel to each other when flat contacts are used. Otherwise the operating conditions change and premature or late closure may result.

Since transfer of metal takes place during arcing and operates as a function of the current through the arc, one way to reduce it is to reduce the period of arcing. This may be accomplished by using fast acting relays and making sure that there is no chatter. In other words, once a contact has opened or closed it must stay that way. Chatter depends upon the weight of the moving parts, contact pressure, and the operating voltage. Therefore, proper relations between the weights of the various parts, spring pressures and voltages to obtain the ultimate in functioning are necessary. It has recently been established that metal powder-filled balls do not bounce when dropped because the internal friction between particles absorbs the potential energy before it can express itself as bounce or as applied to relay springs, as chatter. This characteristic may be of significance in future designs.

In circuits of 30 volts and at currents of 100 amperes or so the contact metal tends to melt and be flattened by the blow at the contacts as they reclose after a bounce. Consequently such contacts operated at currents beyond 100 amperes take on a fine granular or mottled appearance and transfer of metal is absent. Welding takes place at a point somewhat above this in the current scale, being determined by the thermal capacity of the contact assembly and the materials from which the contacts are made.

Effects of Welding

Effects of welding are minimized by taking the heat away rapidly, by opening the contacts with a hammer-like blow calculated to break any weld which may exist, by adding one of the substances, referred to above, to the silver, and by a design which involves high initial contact pressure and high contact velocity on the close so that the metal projections are kept fairly well flattened. Many of us are familiar with the type of power relay that employs carbon contacts to make and break high current circuits. In this type of relay the carbon contacts close first and then metallic contacts, frequently copper, close to maintain the circuit. On the break the metallic contacts open first, leaving the carbon contacts to make the final break and take the arc.

Carbon, of course, stands up very well under such conditions, but the resulting relay necessarily is bulky and heavy. Such relays have been used for years in applications where bulk and weight were not too important, but with the intensive development in aircraft equipment, the need for compact, light power relays led to very comprehensive studies of contact materials and their characteristics.

The result is the introduction of a series of new contact metals which may be incorporated in an aircraft relay and will give excellent service under trying conditions. It is rather obvious then that the preceding discussion is a brief summary of the findings for this application and it can be expected that the future will see a radical change in the construction of relays for various industrial applications as the result of the aircraft progress.

Telephone Type Relays

In the relay, commonly called the telephone type, we note that one of a pair of contacts has a flat contact disc, and the other a cone contact. Furthermore, if the relay is examined closely, it will be observed that after the contacts close the springs continue to move slightly. This extra movement is called "follow" and serves two purposes. First, it insures continuing pressure to prevent chattering and, second, it provides a wiping action that tends to make the contacts self-cleaning.

Without follow, vibration or some sudden shock might cause the contacts to separate momentarily and thereby interrupt the circuit. If there were no wiping action any dirt, grit or other foreign material between the contacts might prevent closing of the contacts, or at least the introduction of noise into the circuits. When we realize the complexity of the telephone circuits and the sequence of operations that may follow the closing of one relay, it is extremely important that the operation of the relay be positive.

Contact arrangements on relays vary from the simplest form, single pole, single pole switch equivalent, through single, pole double throw make-before-break combinations to a multiplicity of various types of spring pileups. If a pair of contacts close when the relay is energized it is called a "make", whereas if the action is the reverse it is known as a "break." The term "transfer" is applied to a single pole, single throw combination and this may be either "break-make" or "make-break." There also are spring combinations, which close one circuit before another circuit is opened. These are known as "make-before-break."

It is often possible to so adjust the springs of a relay that the original combinations will be changed. This particularly is true in the case of transfer combinations, which may be readjusted to the "make-before-break" type. Since it is possible for the spring adjustment of relays of this type to change, and also for the contacts to become dirty, rather frequent inspections should be made.

One of the smallest aircraft relays is only slightly larger than a man's thumb, but is rated at 10 amps. and will make and break 30 amperes at 24 volts up to 40,000 feet. It is housed in a dust-proof enclosure, which can be mounted in any position and on metal or non-metallic surfaces. It is designed to work at any temperature from plus 95 to minus 40 degrees C.

Another unit weighing only 9 ounces can interrupt an inductive load of 1 amp. at 125 volts. A 1-2/3 oz. unit has a rating of 1 amp., 50 watts and 2 amps. at 100 watts. A 6½ oz. unit can have as many as 12 contact springs, while a 5 oz. device operates on 6.5 volts although rated at 12 and carries 10 amps. at 30 volts DC. Still another 5 oz. unit, which has a nominal coil voltage of 14, will operate on 5 volts and at an altitude of 40,000 feet. Its capacity is 20 amps. at 30 volts between minus 40 and plus 90 degrees C. Two other types weighing 1-2/3 and 2 oz. have six and 12 springs respectively. Operating speeds are from 2 to 16 microseconds, with release speeds of from 5 to 85 microseconds.

It can be seen readily that these aircraft relays must withstand exceptionally severe operating conditions. For example, the temperature may be as wide as from plus 200 degrees to minus 40 degrees Fahrenheit and extremely high humidity. One unit will withstand 1,000 hours operation in 100% humidity.

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DELEGATES ATTENDING THE I. A. ILLINOIS STATE CONFERENCE HELD RECENTLY IN SPRINGFIELD, ILL.

The Care and Maintenance of Motor Generator Sets

By *HENRY B. SELLWOOD*

IN GENERAL a motor generator set is used to convert one form of electrical power to another form. As such, it may be driven by either a.c. or d.c. power and then deliver either d.c. or a.c. power at the same voltage as the driving power or at some higher or lower voltage. We commonly think of a motor set in so far as sound systems are concerned as a unit of rotating electrical machinery consisting of a motor and a generator. These two components may be entirely separate and only mechanically connected so that the motor may drive the generator.

On the other hand, there are units built that have both motor and generator armatures on the same shaft and the fields in a common housing. The characteristics of the two types can be the same, but the appearance and servicing are quite different; d.c. and a.c. can be obtained from the same armature and a common field. Such a unit usually is called a converter and in sound systems is used to obtain a.c. for the operation of the amplifiers and power units when the only power supply available in the theatre is d.c. In addition to the converter, the arc generator and the low voltage d.c. output motor generator used to supply heater current and field excitation in some of the older systems, are only units regularly encountered in sound systems.

Motor Speed Control

In all of these units constancy of output, either voltage or current, depending upon usage, is required. The first consideration is speed regulation. In an a.c. motor the speed, within the load limits of the unit, is determined by the frequency of the supply. In a d.c. the supply voltage and design determine the speed. To take care of variations in supply voltage and load some sort of regulating device is necessary. This device usually adjusts the field strength to compensate for changes in voltage—it may be mechanical or electronic.

The mechanical type is known as a centrifugal governor and consists of two contacts mounted on an insulated disc which revolves on the motor shaft. As the speed of the motor increases, the contacts tend to move away from the center due to centrifugal force. If adjustable set screws are provided to position the springs not only can nominal speed be established but also the deviations from normal can be controlled. These contacts are connected across a resistor in series with the motor field. When the contacts are open the field current in a shunt-wound motor is decreased, and the motor tends to speed up. Conversely, when the contacts close, the field strength increases and the motor speed decreases.

In the electronic type of control the principle is the same. Instead of contacts on a revolving disc, we may substitute relay contacts, the relay being energized by plate current in a vacuum tube. When the voltage increases plate current flows and the relay closes, thereby short circuiting the resistor. In one such device two relays are employed. At normal speed one relay is closed and the other open. If the speed decreases, the closed relay opens. When the speed increases the open relay closes and the closed relay remains closed. This provides more flexibility of control.

In a generator the output voltage and current and also frequency, in the case of an a.c. generator, are determined by the speed and field strength. Speed and, therefore, frequency regulation are directly related to the speed of the motor; hence the necessity for its careful control. Field strength determines the voltage and current with varying loads.

There are three types of field windings: Shunt, series and compound. A shunt winding is, as its name implies, connected across the line when the power supply is d.c., or across the brushes of the d.c. winding of a generator when such a unit is self-excited. It may be said here too, that there are two types of generators—separately excited and self-excited. When a generator is separately excited the field supply power may come from the d.c. power supply that runs the motor, in which case it is said to be line-excited, or it may come from a separate generator known as an exciter. In a self-excited d.c. generator the field is connected across the brushes, but in an a.c. generator a second winding is provided on the armature and connected to a commutator, the shunt field winding being connected across the commutator brushes. Assuming constant voltage across the shunt winding, the output voltage of a shunt-wound generator will decrease as the load increases, which is not desirable for sound system application.

In one type of d.c.-a.c. motor generator set the series winding for the generator is in series with the motor armature. As the load increases the armature current increases, and so the series field strength increases.

Compound Wound Generator

In a series-wound d.c. generator the field winding would be in series with one of the commutator brushes, but this type of unit is not practical since, assuming that the remanent magnetism in the pole pieces is sufficient to generate voltage in the armature, the field strength increases as the load current increases and, therefore, the voltage would continue to rise as the load increased.

However, this important characteristic is used in maintaining constant output voltage by combining series and shunt windings and calling the resulting machine a compound-wound generator. An under-compounded generator is one in which the voltage decreases with load, while when the machine is over-compounded the voltage rises as the load increases. In a flat compounded unit the output voltage remains constant with load.

This short discussion of the electrical functioning of motor generator sets will serve to indicate that careful maintenance is necessary if the unit is to continue to function in the manner prescribed by the manufacturer. Motor generators are constructed ruggedly, and it is granted that they will put up with a lot of abuse before they actually fall apart like the old one-horse shay.

The time consumed by a regular inspection is not great and it will give assurance that the unit will not fail during a show. The manufacturer's recommendations for care and maintenance should be followed wherever possible. However, if information of this type is not available, these notes should prove helpful in properly caring for the unit.

Let us first consider the matter of lubrication. If the bearings are not properly lubricated heating will occur and the bearings wear rapidly. If over-lubricated, the excess lubricant will tend to flow along the shaft and may cause electrical failure. The function of all lubrication is to provide a film of oil or grease around the revolving shaft, actually lifting it away from its bearing.

If a perfectly ground shaft is examined under a miscoscope it ceases to be smooth, but shows a series of ridges and mountain peaks. The bearing presents the same picture and so if these two surfaces are in contact during rotation it can readily be seen that these ridges will have a tendency to lock and the force necessary to the shaft rotation will generate heat.

When the unit is at rest the weight of the armature forces the lubricant from between the shaft and the bearing at the bottom; then when the unit is started the point of contact may be considered to be unlubricated. Thus there is so much friction between the shaft and bearing that the shaft actually climbs up the bearing an infinitesimal amount in the direction of rotation where it encounters a film of oil. Lubricant is drawn beneath the shaft and is carried around by the shaft. Thus, a film of oil is reestablished between the bearing and shaft and the shaft slides back with the film still maintained.

This condition takes place with both sleeve and ball bearings and serves to demonstrate why idle machines seem stiff when turned by hand while they turn readily immediately after being stopped. It also illustrates how the film of oil is built up and maintained. Grease generally is used in ball bearing machines. Only the best grade of acid free ball-bearing lubricant should be used. The grease cups should be kept full and the cap given about one turn per week, the amount, of course, depending upon the number of hours the unit is in operation. Whenever new grease is added, care must be taken that it does not come in contact with foreign materials, such as dirt or grit, which naturally act as abrasives and will cause heating and wear.

When sleeve-bearing machines are used, the general lubricant is oil. Here a good grade of oil should be employed. The oil cups, if provided, should be kept full; if wicks are used they should be kept saturated. This is all governed by experience with the machine. The danger of over-lubrication always is present and must be guarded against.

If your motor generator is equipped with drain plugs below the bearings it is advisable to periodically flush out the bearing housings with flushing oil. Be sure that no grit or dirt is allowed to enter the housing during this operation. Also, be sure that oil does not flow on to the commutator, slip rings, armature, or field.

Commutators Not Lubricated

Under no circumstances should the commutator or slip rings be lubricated. Lubrication of the commutator would cause the oil to lodge between the segments and stick to any dirt and copper or carbon dust that is around, forming a very nice conducting path between commutator bars. This may approach a short circuit, with the resulting heating of the armature. The brushes used on the machines are designed to function properly without any lubrication. As a matter of fact, any lubricant will impair rather than aid their functioning. In this connection, always replace brushes with the identical type. Some brushes are hard, others soft; and some of them contain lubricant-like materials while others have very little, if any. The use of the wrong type of brush may cause sparking, commutator wear, heating, and generally unreliable operation.

On machines equipped with a centrifugal governor the contacts on the rotating disc should be examined every 500 to 1,000 hours of operation. If there is any evidence of pitting or burning, burnish carefully with a point file to avoid misalignment of the contacts. If the contact surfaces are flat, with a gray sand blasted appearance, it is safe to assume that they are in proper operating condition. The gap between the contacts should be maintained, the usual opening being .020″.

If it has been definitely established that the speed of the machine is incorrect, the positioning of the contacts may be changed by adjusting the screws above and below the contacts. If the speed is too high, adjust the screws so that the contacts move inward; if it is too low move the contacts away from the center. At the same time examine the governor brushes and see that they slide freely in their holders, making good contact with the two-section commutator on the rear of the rotating disc. Always replace brushes before they are completely worn out. The commutator should be kept clean and polished; any striations (grooves) should be carefully removed with a point file or a crocus cloth.

Motor and generator brushes should be examined at the same time. They

should also slide freely in their holders, and each spring-finger should move easily and maintain uniform pressure on the brush. Brushes that are too short may cause sparking and burning and result in failure of the unit. Here again always replace brushes before they are completely worn out. New brushes should, in every instance, be ground to fit the contour of the commutator or slip rings. A good plan to follow is to slide a piece of sand paper of convenient size between the commutator and brush, with the sand side toward the brush. With the sand paper conforming to the contour of the commutator, slide it back and forth in the direction of rotation and at the same time applying pressure to the brush.

Never use sand or emery paper on commutator surfaces. Whenever any mica is flush with the surface, undercut 1/32" and then dress the running surface with a commutator stone. Undercutting a commutator must be done carefully to avoid scarring the running surface, but if the proper tools are not available a hacksaw blade may be used. Make certain that the mica is undercut beyond the brushes, otherwise brush chattering may occur and bring about sparking.

Adjustable Resistors

In some instances adjustable resistors are provided in series with the motor field. A resistor of this type usually is provided to compensate for a change in field resistance due to a substantial change in ambient temperature. It should not be re-adjusted to affect a change in the normal speed unless the centrifugal governor cannot be adjusted to obtain the desired speed. In this case it would be better to have a manufacturer's representative make the adjustment.

Should it be necessary to make the adjustment prior to the arrival of the representative or service inspector, disconnect one lead from the centrifugal governor, apply 10% below the normal voltage to the motor, and with normal load on the generator adjust this resistor so that the motor speed is approximately 7% above normal. When this is done, apply normal voltage to the motor (still with normal load on the generator) and adjust the centrifugal governor until the speed is normal. Any generator field resistor provided may be adjusted as required to obtain rated output. It must be borne in mind, however, that the voltage applied to the motor must be within the rated limits of the machine and the generator load also must be in accordance with the machine rating.

The entire machine should be inspected at regular intervals. Accumulated dust and dirt should be removed, and carbon and copper dust should be dislodged

from the brush holders, studs and stud insulation.

It must be remembered that most motor generator sets are equipped with a fan for ventilation purposes and that this fan continually is drawing air from the room into the unit. It is not surprising, therefore, that what seems to be an unbelievable amount of dust and dirt collects in the machine and lodges in the most inaccessible places. The more moisture and oil vapor in the room, the more this dirt will stick. On warm or hot surfaces dirt and dust will bake into a hard crust if permitted to accumulate. This slows down proper heat radiation and as a result the machine will run hot. The importance of cleanliness of the unit is obvious.

Your motor generator set is just another one of the units in your projection room that cannot be replaced during the war. Parts replacements are not only difficult to obtain, but the deliveries of replacements are very slow and uncertain. It therefore behooves us to do our utmost to conserve such units by careful inspection and maintenance.

WPB WITHDRAWS RESTRICTIONS ON 35-MM EQUIPMENT

The War Production Board has withdrawn controls contained in the copper and steel orders over manufacture of 35-mm projection equipment, it is announced by the agency. In a new order L-325, manufacturing and distribution curbs are more flexible.

The order became effective on Dec. 6 and under its regulations manufacturers are prohibited from manufacturing new equipment without WPB permission. Another part of the order gives permission for the lending, without authorization, of new equipment to an exhibitor in case of emergency for a period not to exceed sixteen weeks.

Production of accessories, except to fill rated orders and to maintain practical working inventories, is prohibited, and permission is granted for unrestricted distribution and production of repair units, with the qualification that exhibitors must continue to secure such units as previously.

It is pointed out that the removal of the industry from direct governance by the copper and steel orders places authority in the service equipment division and that under the order Allen C. Smith, theatre equipment chief, will negotiate for materials.

SEES BROAD TELEVISION GAINS IN POST-WAR ERA

Television broadcasting cannot become a substantial, self-supporting, profitable medium until receivers are in millions of homes, according to Thomas F. Joyce, in a recent address before the Advertising Club of New York and the American Television Society. Mr. Joyce, manager of the radio, phonograph and television department of the RCA Victor Division of the Radio Corporation of America, said that given a good low cost television receiver that is within the buying power of the average home broadcasting facilities. program service will develop with a speed that will amaze even the most ardent friends of television.

Mr. Joyce detailed a four-point program for his conclusions, taking in the following reasons: 1—Existing radio station owners are smart enough to know that if acceptable television receivers can be produced for the mass market, audiences will be built at a rapid rate; 2—Application for television licenses by 100 or more prospective operators, "which I believe the advent of an acceptable low cost receiver would bring forth," would have a salutary effect on the price of television transmitters and studio equipment; 3—Business interests erecting television transmitters in key cities would create pressure for development of network facilities; 4—Big national advertisers would recognize that the existence of the low price television receivers would assure rapid development of a vast home audience.

The speaker further said that "in approximately five years after the commercial resumption of television, transmitters located in 157 key cities of the United States should be making program service available to a primary market consisting of 72,159,000 people, 17,252,000 wired homes, or 59.6 per cent of the total and 61.5 per cent of the United States purchasing power.

STANLEY HAND NEW ADVERTISING DIRECTOR FOR ALTEC

Altec Service Corporation announced the appointment of Stanley Hand as advertising and publicity manager. He also will continue in his capacity as staff representative for the company.

Mr. Hand is filling the post left vacant by Harold Wengler.

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of the transmission band.

To explain vestigial side band transmission it should be recognized that one side band by itself carries all the characteristics of the signal; no more intelligence is carried by the other band but simply more power. Thus, if advisable, we may partially eliminate one side band, leaving enough of it to avoid certain distortions. This is called "vestigial side band" transmission and has the advantage that the width of the frequency band required for the channel may be decreased to approximately five-eighths that required by the ordinary double side band method.

It has been found desirable to transmit the picture and sound in the same television channel. This permits the use of a single oscillator for both sight and sound in the superheterodyne television receiver, thus greatly simplifying the tuning. In this system, the sight and sound signals are separated by selective circuits in the intermediate frequency amplifiers.

It would be well to again emphasize the necessity for considering the television receiver as an integral part of an entire system. This is in contrast to sound broadcasting. Television receivers must be designed for transmitters which operate on well-defined standards. If changes are made in these standards, all television receivers might become obsolete or might have to be modified. This is one important reason why so much time and money have so far been spent to develop television to a practical commercial stage before its introduction has been too widespread.

Important Tele Standards

Some of the other more important standards which have already been agreed upon after so much study and experimentation are of interest:

The width of the standard television broadcast channel shall be 6 megacycles per second.

It shall be standard to locate the picture carrier 4.5 megacycles per second lower in frequency than the unmodulated sound carrier.

It shall be standard to locate the unmodulated sound carrier 0.25 megacycles per second lower than the upper frequency limit of the channel.

The standard picture-transmission amplitude characteristic shall be that shown in Fig. 6.

The standard aspect ratio of the transmitted television picture shall be 4 units horizontally to 3 units vertically.

This is the same aspect ratio as is standard for motion pictures. It has, therefore, been generally accepted by the public as satisfactory. Furthermore, many television programs may originate from motion pictures and the adoption of this standard does not add complications to so doing.

It shall be standard in television transmission to modulate a carrier within a single television channel for both picture and synchronizing signals, the two signals comprising different modulation ranges in frequency or amplitude or both.

So far in these articles nothing has been said about the very important synchronizing signals which are used. This will be done in subsequent installments but this standard is mentioned so that the reader may be aware of their existence and that they are transmitted in the same channel as the picture signals.

It shall be standard that a decrease in initial light intensity cause an increase in radiated power.

It is necessary to standardize on the polarity of transmission to prevent the possibility of the picture tube at the receiver showing the equivalent of a photographic negative. Negative polarity has been agreed upon. Unless the receiver

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APPLICATION OF RELAYS

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Then we have the vibration condition. This severe test is applied; 5 to 55 cycles per second at 1/32 in. amplitude (1/16 in. total). Vibration naturally aggravates the chatter condition and various means have been taken to overcome this trouble. In some instances high contact pressures are employed; in others a locking or latching device is employed, while in still others a magnetic holding device is employed whereby positive holding is insured on both sets of contacts.

Locking a Relay

One of the simplest methods of locking up a relay is to connect a set of the relay contacts across the switch that energizes it. Then, as soon as the relay operates, these contacts continue the flow of current through the coil, and so the relay remains in the operated position until the coil circuit is opened by a normally closed switch. For this usage, momentary switches; that is, switches that remain in the operated position only as long as depressed, are used.

While a solenoid may be classed as a relay, its operation is different in this respect. In principle, a solenoid consists of a hollow electromagnet with a movable plunger inside the coil. When the magnet is energized, the plunger is displaced from its unoperated position. This movement serves to close or open contacts in the same way as in the case of the usual type of relay. The force exerted by the plunger also may be utilized to operate a mechanical mechanism such as a two-speed clutch. So it may perform one more function than a relay. In some instances it may be desirable that the contacts move parallel to each other. The solenoid is capable of performing in this manner.

If you have relays in your projection room, study their mechanical construction, find out just how they operate and just what functions they perform. Then figure out the adjustments required for proper carrying out of these functions. In this way you will have determined when they are working as they should and when servicing is necessary.

In general, the relay coil gives little or no trouble unless the actuating voltage is increased above the rating of the unit. About the only difficulty is the loosening of terminals, in case screw connections are used. If the voltage is low the relay may not operate, or in the case of a locking relay it may not remain locked up. The contact requires the most attention. If the spacing is not right it may not close properly; arcing may occur and also chattering. Lack of sufficient contact pressure or follow may result in chattering when any vibration exists.

Arcing depends to some extent upon the speed at which the relay operates. This is not controllable to a large degree, but may be increased by reducing the air gap. But this has to be watched as the relay may not release if the gap is too small due to remanent magnetism in the pole pieces.

Above all, be sure that the contacts are kept clean and polished and that the clearance between the contacts is maintained. All of this adds up to the statement that, while the relay is not an imposing and spectacular unit of the equipment, it is of vital importance and regular intelligent maintenance will keep it going and avoid embarrassing interruptions.

JURY CHARGES NEGLIGENCE IN TORONTO FILM FIRE

That the death of Herbert Nayman, Local No. 173 member who died in the recent film fire in Toronto, Canada, was due to negligence, is the charge made by a jury appointed to investigate the origin of the fire.

"We believe the fire was caused by marked negligence in not carrying out regulations of the Theatres and Cinematographs Act, by allowing a quantity of naked film to be stored in vaults," states the jury's report.

According to the evidence submitted, the jury agreed that since films are extremely hazardous they should at all times be placed in metal containers. They recommended that more stringent measures be taken by the Theatres and Cinematographs Department of the province in guarding against future film fires.

The jury also suggested that film exchanges and distributing agencies be located in buildings no higher than two stories above the street level, outside the city limits. They further recommended that these buildings should not contain offices or projection rooms, or any place where films might be shown.

Presenting: Floyd M. Billingsley

FLOYD M. BILLINGSLEY, fourth vice-president of the I. A. and business agent of local No. 162, San Francisco, Calif., is one of the most popular and best known individuals in the craft. He was born May 5, 1890, in San Marcus, Texas.

Thirty-six of his fifty-three years have been spent in show business, his first venture being connected with the installation of the first nickolodeon in Austin, Texas, in 1907. Having been bitten by the show business bug, Billingsley has remained in this field ever since, working during the intervening years as both stage hand and projectionist.

He was appointed to the office of business agent for Local 162 in 1929, and with the exception of a two-year interlude when he voluntarily gave up that office to devote more time to his I. A. duties, he has held that post ever since then. In 1931 Billingsley was appointed to the General Executive Board of the I. A. T. S. E. as fourth vice-president and has been reelected at every convention to date.

Billingsley's record shows him to be a credit to the organized craft, a real leader of men and one who will aid further in building the prestige of our industry.

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is designed for this polarity from the transmitter, the synchronizing signals would not be effective.

It shall be standard that the black level be represented by a definite carrier level, independent of light and shade in the picture.

This means that the background level is transmitted in a television signal, thereby eliminating the need for readjustment of the receiver when the scene being televised changes from a preponderance of white to a preponderance of black.

It shall be standard to use frequency modulation for the television sound transmission.

The advantages of frequency modulation, over amplitude modulation for the transmission of the sound has proven to be so great in terms of clarity, dependability and economy of transmitting power, that this standard has been adopted. The use of frequency modulation is well suited to the purpose particularly as ultra-short waves are being used anyway for television transmission.

There undoubtedly will be changes to these standards for television transmission in the future but I think it is safe to say that enough thought and study has been given to the matter of standards by all of the engineers of the industry to produce a situation which will permit the widespread introduction and expansion of television.

[1] Frequency modulation is a system for sound broadcasting that differs from amplitude modulation, previously described, in that the frequency of the carrier wave of constant amplitude is modulated or varied by the sound to be transmitted.

Altec Scientific Research Will Benefit Industry After War

DURING the three-day general conference held at the Park Central Hotel, New York City, Dec. 1-3, executive field personnel of Altec Service Corporation heard current problems being discussed.

L. W. Conrow

L. W. Conrow, president Altec Service, covered prospects, as did other executives, and brought out that there is much information that cannot be disclosed at the present time because of the war. He did mention, however, that improvements in technique would enhance greatly the projection of talking pictures during the post-war period. "The equipment in the motion picture projection room today," declared Conrow in his address at the opening gathering, "is the very heart of an exhibitor's business, and will become an even more important focus of attention as rapidly changing conditions make themselves felt in the technical field."

Allen G. Smith, chief of the Amusement Section of the War Production Board, talked at the closing day's session where, at a luncheon, he brought up points of interest relating to priority regulations.

Many other addresses were made, with the affair being concluded with a dinner at the Union League Club.

Attending the conference were L. W. Conrow, president; G. L. Carrington, vice-president; H. M. Bessey, secretary-treasurer; E. Z. Walters, comptroller; Stanley Hand, staff representative, and Paul Thomas, general credit manager.

The district managers in attendance were L. J. Hacking, Boston; B. Sanford, New York City; D. A. Peterson, Philadelphia; H. B. Moog, Atlanta; F. C. Dickely, Detroit; Warren Conner, Cincinnati; C. J. Zern, Dallas; R. Hilton, Chicago; B. W. Ardell, Seattle; S. M. Pariseau and R. A. Quinn, Los Angeles. New York branch managers D. L. Turner and A. J. Rademacher were also present.

The Hollywood group included James B. Lansing, Altec Lansing vice-president; J. K. Hilliard, A. A. Ward, E. O. Wilschke and A. Fiore. Martin Bender and H. S. Morris of the New York engineering group and C. S. Perkins, Electronic Division, Lexington, Mass., also were among those present.

• BUY WAR BONDS •

SMPE SPRING CONFERENCE WILL BE HELD IN NEW YORK

The fifty-fifth semi-annual technical conference of the Society of Motion Picture Engineers will be held in New York on April 25-27, according to William C. Kunzmann, SMPE convention vice-president.

The fall conference of the Society, recently held in Hollywood, was the best attended and the outstanding meeting held by the organization since its formation in 1916.

"To date," Mr. Kunzmann said, "all wartime conferences held by the Society have been a success from the viewpoint of attendance and papers presented. It indicates the Society is playing an important part in its contribution to the existing wartime technical problems within the industry."

The Hotel Pennsylvania will be the headquarters for the New York conference.

SPOTLIGHT

(Continued from page 17)

claim of the local union officials that the projection of motion pictures is a profession. He also stated that he could teach anybody all there was to know about projection in 30 days.

As an aftermath of his outspoken prejudices, the "learned" professor was removed from the Board. At this writing the Board's decision in this particular case is not known to us, but we will advise our readers as soon as we get the word.

● For the second time in a year, some prankish youngster threw a lighted cigarette into a circular duct under one of the orchestra seats in the Paramount Theatre, New York City, causing a heavy pall of smoke to fill the theatre. The smoke was first noticed coming up through the ventilators in the projection room and the projectionists immediately notified the management.

In order to avoid a panic in the theatre, the quick-thinking projection crew at once boosted the amperage so that the picture on the screen was visible through the dense smoke and the attention of the audience was centered on the screen presentation. Meanwhile, the fire was extinguished and except for the fact that the theatre was filled with smoke for a while, the people in the audience did not know how close they were to a panic until they read about it in the newspapers.

The first time this occurred, the theatre management sent a letter of thanks to the projection crew for their part in averting what might have turned out to be a tragedy. For the second occurrence, the fireman who put in an alarm for the fire apparatus received the credit. However, that is unimportant—the important thing is that for a second time within a year the alert projection crew prevented a panic in one of New York's De Luxe theatres.

● Bob Tomsen, business agent of Local 143, St. Louis, Mo., was appointed by the mayor of his city to serve on a committee of prominent labor and civic leaders chosen to supervise the building of a monument honoring the dead of this war.

● We are very happy to report that Texas justice finally prevailed and the labor leader mentioned in these columns last month was acquitted of the charges of trying to organize workers without a state license. Texas I. A. locals should lose no time in making every effort to wipe this Un-American law off the state books.

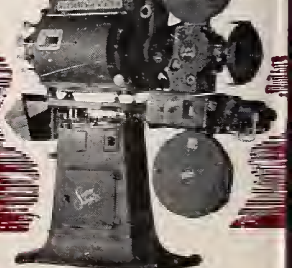
● Bill Sicaras, projectionist at the Rialto Theatre in Hartford, Conn., and member of Local No. 486, has become the father of a future Miss America. Congratulations, Bill—you can now take your sound lessons right at home.

● We regret to report the sudden demise of Fred Cady of Local No. 293, New Orleans, La. Fred was a veteran in this field and left a host of friends.

TORONTO L. 173 ELECTION

Results of election of officers for Local No. 173, Toronto, Canada, are as follows: David Siegel, president; Bert Higgins, vice-president; Geo. H. Jones, secretary-treasurer, and Lou Lodge, recording recretary.

Other officers elected were H. Dobson, E. Sheilds, J. Youmell and C. Wells to the executive board, and C. Andrews, B. Lawrence and J. Stephens, trustees. J. Sturgess, G. Demery and B. Higgins were elected convention delegates.



INTERNATIONAL PROJECTIONIST

JANUARY 1944

VOLUME 19 • NUMBER 1

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for THIS battle, G.H.Q. is at YOUR own desk!

★ Here's how you—yes, YOU—can carry out a smashing "pincer movement" against the Axis. Swing in on one flank with increased production of war goods! Drive in on the other with redoubled purchases of War Bonds through your Pay-Roll Savings Plan!

You're an officer in both of these drives. Your personal leadership is equally vital to both. But have you followed the progress of your Pay-Roll Savings Plan as closely as you have your production?

Do you know about the new Treasury Department quotas for the current Pay-Roll Allotment Drive? *Quotas running about 50% above the former figures?* You see, these new quotas are based on the fact that the armed forces need more money than ever to win the war, while the average worker has more money than ever before to spend. Particularly so, on a *family income* basis—since in so many families several members are working, now.

Remember, the bond charts of today are the sales curves of tomorrow! Not only will these War Bonds implement our victory—they'll guard against inflation, and they'll furnish billions of dollars of purchasing power to help American business re-establish itself in the markets of peace.

So get this new family income plan working at once. Your local War Finance Committee will give you all the details of the new plan. Act today!

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ON TARGET

Kodak optical systems for fire control destroy the legend of "German supremacy" in lens making

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REMEMBER CORREGIDOR?. . . *and the last words over their radio —"Just made broadcast to arrange for surrender . . . everyone is bawling like a baby . . . I know how a mouse feels. Caught in a trap waiting for guys to come along to finish it up." Corregidor is a stern example to us at home.* **BUY MORE WAR BONDS.**

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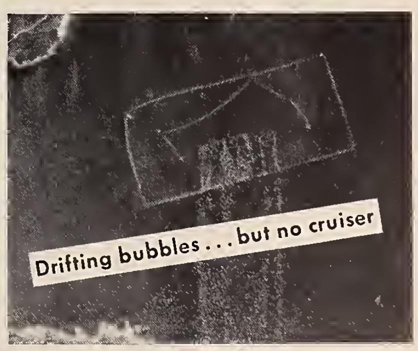

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With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

EVERYONE can aid in the government's campaign to save a million tons of paper, and we in this industry can do our part every day by gathering together every bit of waste paper and sending it to the proper collection agency. When it is realized that it takes twenty-five tons of blueprint paper alone to make a battleship, and that 700,000 different kinds of items are shipped to the armed services—and that they are paper-wrapped or boxed—it takes no mathematician to figure out that every pound of waste paper is going to help win the war. So, save every sheet of paper possible and every container, that they may work again in the fight for freedom.

• • •

Quartz has gone to war. We have all heard of the quartz crystals used in the radio industry, but fused quartz is not so well known outside of the laboratory even now. Transluscent fused quartz is made from a very pure grade of sand, while the clear fused quartz is made from crushed natural crystals. Its coefficient of expansion is 1/34th that of copper, making it particularly useful for various type of standards. Electrically it is high in resistance, low in dielectric loss, and able to withstand wide and sudden temperature changes. Chemically it is affected only by high concentrations of hydrofluoric and phosphoric acids. It may be obtained in a variety of shapes and machined to specifications.

Many new and novel uses are being found for this material. It is especially suitable for condenser lenses. Because of the proximity of the arc to the center of the lens, the temperature gradient from the center to the edge is high. In the case of glass the strains set up are cause of much breakage. This happens particularly when a draft of air strikes the lens or when it becomes badly pitted by molten metal from the arc. Quartz lenses easily meet this service and even though they may be pitted after many days of use they readily can be resurfaced.

• • •

Production of some formerly critical materials such as magnesium, aluminum, copper and certain alloy steels has been increased to the point where stockpiles are accumulating. These materials now are not retarding war programs. On the other hand plastics are still close to the critical point, as they have been used as substitutes for so many formerly critical ferrous and non-ferrous metals. Plastics production, although greatly expanded, has not kept abreast of demands. But the materials situation is better and is becoming brighter.

INTERNATIONAL PROJECTIONIST

VOLUME XIX JANUARY 1944 NUMBER 1

Types and Care of Changeover Switches

By *WILLIAM G. NAFASH*

WHEN the unknown Mr. X first thought of using two projectors, to eliminate the ONE MINUTE PLEASE slide, little thought was given to a changeover device. The projector drive in common use in those early days was the well known "Armstrong," consisting of a sturdy crank and a healthy muscle. The first operator (the word projectionist had not yet been coined) would slam his dowser shut, while the second operator opened his, and the wonder of the age, an uninterrupted movie show would clank and quiver on.

Other theatres used one a.c. inductor for both lamps, changeovers being made by stealing the arc. Various home-made devices began springing up. A string from dowser to dowser, or a length of pipe with a piece of tin on each end, mounted on the front wall, and finally the prize winner of them all. An enterprising operator fastened both projection port shutters together with pulleys and a string; raising one would lower the other. In case of a fire? Well——

But all these devices, even at their very best were still makeshifts, and when the long overdue electric changeover put in its appearance, it was embraced with open arms. It is now a "must" in all projection room installations. The majority of changeovers manufactured today, consist basically of two solenoid coils suitably mounted, one each for closing and opening. Through these coils passes a movable plunger of soft iron or steel (Figure 1). When either coil is energized the plunger becomes magnetized and mutual attraction takes place, drawing the plunger into the live coil in one direction or the other, depending on which coil received the current. By various linkage methods this plunger is made to operate a dowser, a set of dowsers or a rotating tube.

Changeover Mountings Preferred

It long has been a controversial question as to which type of changeover mounting is best. Some prefer the type which mounts at the aperture, cutting the light directly behind the heat shield and in front of the fire shutter on the mechanism. It is claimed that this type gives added protection to the film when the mechanism is at rest and the projectionist is adjusting his spot on the aperture prior to changing over.

Others prefer the front wall mounting. This type mounts directly to the front wall, or to a bracket attached to the projector mechanism, and it also is used to slowly iris out at the end of a subject. But regardless of the type or mounting used the main requirement is a fast clean changeover, with no overlaps or split second blackouts.

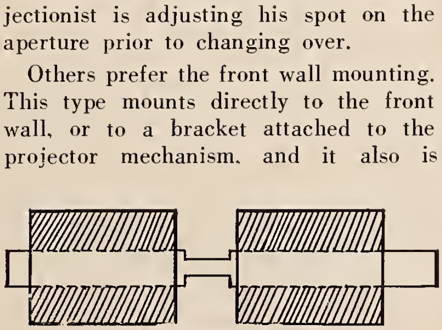

FIGURE 1

A changeover device is more often than not a forgotten item. After it is installed initially no thought or care is given it, until some evening when the big boss is in the house and you're anxious to do your best. You step on the foot-switch and—nothing happens. Then you start cussing.

All this can be avoided very easily by periodical inspection. Go over the linkage. If any excess slack has developed, change the pins, bolts, or arms. Make certain that when the plunger starts to move, the dowser also goes along with it. The coils seldom give trouble, but if one should "go" on you, make sure that the screws you remove to change coils are put back in the same position. Many a new coil has been punctured because a long screw, used elsewhere, was inserted in place of a shorter one.

When replacing a coil make certain that the sleeve which goes between the plunger and the coil fits snugly in its receptacle in the center main frame casting. The outer flange on this sleeve must fit snugly up against the outer housing, and will do so only when the sleeve is in its proper position. Do not force it in, as this will cause the plunger to bind and stick.

Sometimes a dowser will not open or close the required distance. Most mount-

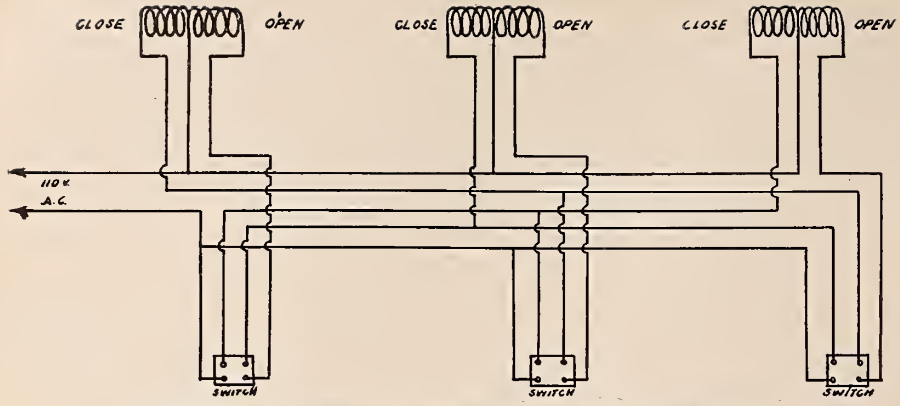

FIGURE 2. *Schematic of four-point short-circuiting switch.*

ings have a certain amount of play in the mounting bolts. So adjust up or down until full opening and closing is obtained. Sometimes a dowser will make a full opening and as soon as you remove your foot from the switch will drop back a bit. Check the spring or snubber which keeps the dowser from backlashing. If this condition is not remedied immediately upon first being noticed. a creeping may develop which may kill the picture right in the middle of a reel.

The changeover must work freely when operated by hand. If any bind is apparent, remove the dowser (aperture type) and try again. If it still is tight you may find a protruding pin on the plunger shaft. If removing the dowser removes the bind, check the spot-sight box to make certain that the dowser travels the entire distance freely. Sometimes the bind is caused by the dowser blade rubbing against the slot; a realignment easily will remedy this.

It always has been more or less of a job to fasten some of the aperture type changeovers to the mechanism. Brackets have been designed by some manufacturers to make this an easy, simple job, in addition to allowing much more freedom for alignment between aperture and dowser blade. Check with your manufacturer or supply house to find out if any are made for your type or style of changeover.

Types of Changeover Switches

It is essential that the closing coil of the outgoing projector receives its current charge in perfect synchronization with the opening coil of the incoming projector. This is accomplished by switches, operated by hand or by foot and located at a convenient spot near each machine. Inasmuch as each coil is to be energized for only a fraction of a second, a momentary contact type must be used. Three commonly used types are the "Four Point Short-Circuiting;" "Five Prong, Three Wire," and the "Mercury."

Figure 2 shows the "Four Point Short-Circuiting" switch with its wiring diagram. as connected for three projectors. If used for a two-machine installation. one less wire between machines is used, and one point on the switch left open. A "4" point H & H momentary contact switch is encased in a rugged housing, which in spite of its huskiness has toe-tip control. To inspect any part of this switch merely remove the bottom cover. There is very little to get out of order, and it needs only periodic inspection to make sure proper contact is being made.

Figure 3 shows the "Five Prong, Three Wire" switch with its wiring diagram. This switch has the advantage of using three wires between machines. regardless of how many are used, but needs proper care and attention. An open front view of this switch is shown in Figure 4. Note that when the button is released contact is made between the two upper prongs. This is important, and good contact must be maintained here because when the switch on the other projector is pressed. these upper contacts complete the circuit for the closing coil on the outgoing machine.

If a changeover doesn't close, first check the upper prongs of the switch you didn't press, *A* and *B* as shown in Figure 4. If you find these in good order, check *C* in the switch you stepped on. If a changeover doesn't open. check contact *D* on the same switch you pressed. The remaining contact *E* is the "live leg," and should be checked with the others.

Plunger contact assembly *F* consists of two sections joined together electrically. One, a solid bar which short circuits *A* to *B*. and *C* to *D*; and two, a lower section with a spring tension, which contacts *E*. This assembly is insulated front and back with Bakelite strips. Occasionally these strips break and the entire plunger contact assembly has to be replaced. This is done by removing the set screw in the center of the assembly, and pulling out the button, shaft and recoil spring. The plunger contact assembly then can be removed easily. Before installing the new assembly, try it on the shaft first. Sometimes this is a tight fit, and can be worked in much easier out in the open. After fitting the assembly to the shaft, insert the set-screw and check for lineup. If the holes do not match up, try reversing the assembly. Make certain that the set-screw goes all the way home before you try assembling the unit in the housing. After you do this, scratch mark the parts and install in the same positions.

Alignment of Plunger Assembly

Alignment of this new plunger assembly to contacts *A* to *E*, is very important. Unless this is done, the new assembly has a chance of breaking within one hour. Do this as follows: Turn off the current and slowly press on the button. As the assembly reaches contacts *C* and *D*, make certain that the bar goes down evenly between the points, and spreads the contacts just enough to be visible to the eye. If this bar should snag either side of a contact, adjustment to the contact. *not* the crossbar, can be made easily with a pair of long-nosed pliers. After *C* and *D* are correct, go further to *E*. then release the button. and see how *A* and *B* make contact. Keep trying until you have all the contacts wiping clean. no matter how you hit the foot-switch. A little extra time spent on this will save you many a future headache.

Figure 5 shows a "Mercury Switch" and its wiring diagram. This is nothing more than a simple mercury switch enclosed in a heavy housing, with a momentary contact spring arrangement. There is nothing to go wrong and requires no maintenance to speak of.

A changeover of unique design is shown in Figure 6. This type is really quite a departure from standard practice as only

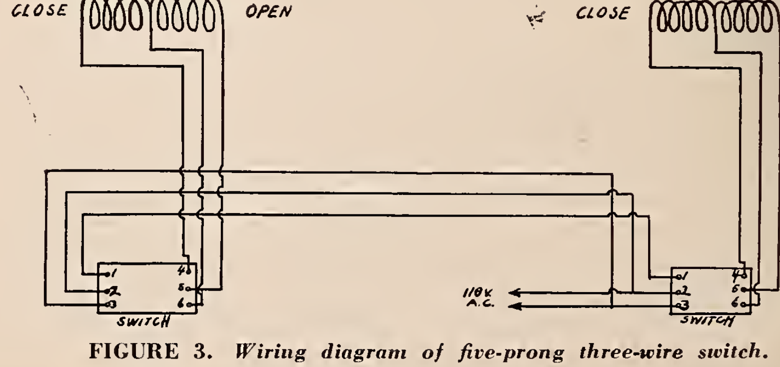

FIGURE 3. *Wiring diagram of five-prong three-wire switch.*

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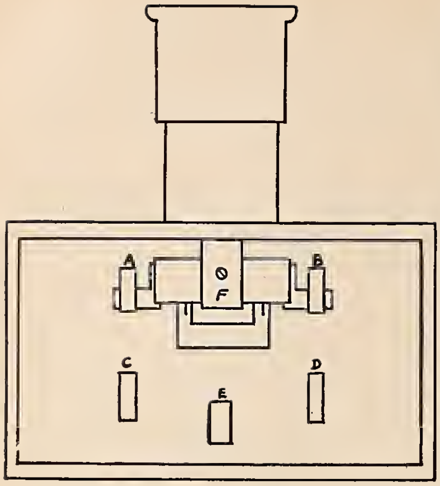


FIGURE 4

one coil, coupled to an ingenious trip device, is used for both opening and closing the dowser blade. No foot-switches are required as the changeover switch is built in. This has the advantage of eliminating all the foot-switch wiring.

The operation is quite simple. Pressing switch *A* in the direction of the arrow

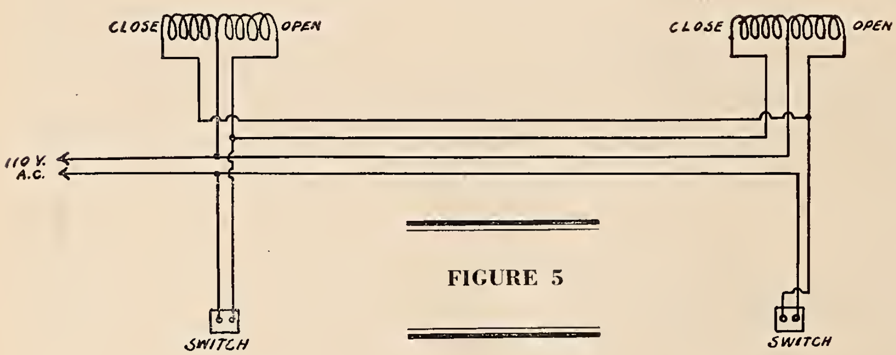


FIGURE 5

builds up a tension in opening spring *D*. This does not raise dowser *H* yet, as cam *J* is held back by pin *K*, which is part of lever *G*. Thus, although the switch has been pressed almost all the way in, nothing will happen, until short-circuiting bar *L* touches and shorts the two contacts *F*. Coil *B* then becomes energized, pulling up lever *G* to the coil. This releases cam *J* and allows the dowser to fly up due to the tension originally built up in spring *D*. So much for the opening.

Meanwhile the coil on the projector which was running also has become energized, and as the dowser already was up it was held in place by the other side of cam *J*. Upon release it flies down, giving added impetus by closing spring *C*.

It sounds complicated but is really a simple mechanism. Electrically there is almost nothing to go out of order. Just make sure the short circuit bar hits the contacts evenly and breaks without excess sparking. Mechanically, as long as pin *K* engages the cam evenly no trouble should be encountered, and this is very easily checked. When you press the switch slowly the dowser must not start to rise until electrical contact has been made. If it does then you know that the pin and cam are not engaged properly. The wiring is nothing but three wires running from one device to the other with a 110 volt a.c. line cutting in somewhere between the two changeovers.

Some theatres, using an aperture type changeover, have added an extension to the coil housing, and installed a sound switch. Opening the dowser automatically would bring in the sound. This makes for a perfectly synchronized sound and projection changeover, but has the disadvantage of not being able to hold over for the last note of music.

One of the mysteries of the craft is the amount of oil that sometimes gathers inside the foot-switch. In one instance a foot-switch and bracket had been mounted to the top of a box imbedded in the floor. When the cover was removed, after years of use, fully two inches of oil was in the box. The insulation on the wiring fell off at the touch. A complete rewiring and relocation of the boxes was necessary.

When wiring any apparatus with armored cable which runs under the mechanism and lower magazine assemblies make certain that the armor is installed facing down, so that any oil will have a tendency to roll off, and not into the armored cable. Check the lower corners of your sound head and motor for oil collection. In most cases this is easily traced to its source.

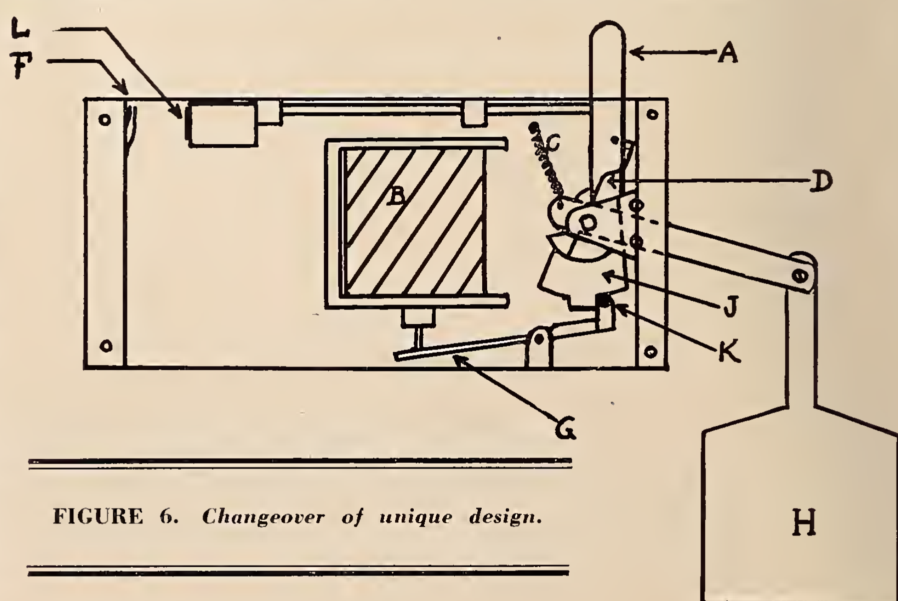


FIGURE 6. *Changeover of unique design.*

Foot-switches, wall switches, or built-in switches—you might ask which of the three is best.

Foot-switches are the most popular as they give the projectionist two free hands to start the motor, open the lamphouse dowser, and changeover sound. But being located on the floor, more attention is needed due to collection of oil and dust.

Wall switches, being located over three feet from the floor and away from the machine, are much easier to keep clean and service. But they leave only one hand free for changeover.

Built-in switches usually are free from dirt and oil, but they only leave one hand free. In some cases where the lamphouse comes all the way down to the rear shutter assembly, and the upper magazine overlaps the spotsight box, it is necessary to turn your head to find the switch. As your eyes must never leave the screen during the changeover period, this sometimes causes a miscue.

All of the changeover devices and switches are built for long wear and reliable service, and require a minimum of maintenance time, in comparison with other equipment in the projection room. In almost all cases your wiring is one of the three shown. Check your installation, find out which one it is and keep it for future reference. It will come in mighty handy when you have to make an emergency check during show time. But don't wait for that. Go over your system at the first opportunity, make whatever adjustments or changes you find necessary, and you will find yourself rewarded in the long run.

The Projection of Motion Pictures†

By *HERBERT A. STARKE*

RKO SERVICE CORPORATION, HOLLYWOOD, CALIF.

THE FINAL phase of a motion picture production is in the theatre. All the preparation and expenditure of money involved in its creation have been reduced to so much film footage. It is now in the hands of the projectionist, with whom lies the responsibility of transferring the material to the screen, through the medium of projectors and a source of light. Motion pictures are an illusion, and are intended to convey realism to the screen.

Upon the arrival of the release print, the normal procedure in first-run theatres is a careful inspection and measurement of the entire footage. For several years, the exchanges have been doubling up the reels of features for shipment. This duty is performed for the most part by girls in the exchange. In other words, the composite film is delivered to them on spools from the laboratory; they in turn mount the *A* and *B* sections on 2000-ft. reels.

Our experience has been that in many cases, this very important procedure is not properly handled. Most of the splicing is done with small mechanical splicers, which are allowed to become worn and out of alignment, with the result that inaccurate splices are made. Many of the girls engaged in this work do not realize the importance of properly blooping out splices. The splicing lacquer is allowed to become thick and slow-drying; and as the re-winding proceeds, deposits from the wet application are smeared on the track over several wraps. This necessitates cleaning with a lacquer remover, and invariably the splices are removed.

Under no circumstances are the shipping reels used; they are, for the most part, badly bent and unfit for use. Most of the best theatres are equipped with cast aluminum reels, upon which the film material is mounted for the duration of the engagement.

Daily Inspection of Equipment

Projection room routine will vary from theatre to theatre. Nevertheless, certain duties must be performed daily. Of great importance are the inspection and cleaning of the following units:

(1) *Projector mechanisms.*

(2) *Upper and lower magazine valve assemblies.*

(3) *Optical systems.*

(4) *Lamp houses, contacts, and all component parts.*

(5) *Take-ups and belts. Proper oiling with manufacturer's specified lubricant. Many projectors have been ruined by inferior oils.*

(6) *Inspection of sound system.*

(7) *Inspection of generators or rectifiers. Motor switches must be replaced at regular intervals. A failure here may cause interruption of the performance.*

It is important that the light from each projector be checked on the screen for intensity and color, and at the same time, image alignment should be checked. Every effort should be made to ascertain that the shutters are perfectly timed; slight bleeding that may not be observed from the projection room will cause loss of definition.

There appears to be considerable lack of showmanship today, and the absence of lighting effects is noticeable. The general procedure is to work out a schedule, the starting time is determined, and the show is on. The practice of giving away cash and other prizes in many of our *de luxe* theatres has not enhanced the production but rather has cheapened it.

The success of the presentation depends largely upon technical conditions often beyond the control of the projectionist. The equipment in many of our theatres today is inadequate, particularly with respect to the available light. Theatre managers seem to be reluctant to seek proper advice when purchasing lamp equipment, and false economy often results in inadequate projection.

Light sources may be divided into three categories: (1) the largest theatres require condenser-type high-intensity arcs; (2) the intermediate theatres the *Suprex* type; and (3) the small theatres the 1-kw a.c. or d.c. types.

Due to its yellow color and low intrinsic brilliancy, the low-intensity arc is being rapidly replaced by an intermediate type of non-rotating high-intensity arc having a color value approximating the white light of the rotating and non-rotating high-intensity arcs. The reflected screen light depends upon the character of the source, the optical system, and the reflectivity of the screen; and last but not least, upon the efficiency of operation. To the projectionist falls the task of coordinating these elements into a single, smoothly operating whole.

Dense prints are quite common today, and it is also becoming the practice to increase the auditorium illumination. Smoking is permitted in many theatres, tending to decrease reflectivity of the screen. The projectionist in the large theatres using the *Suprex* equipment instead of the high-intensity condenser arcs will often increase the arc wattage beyond the rated capacity of the carbon trim in an attempt to increase the brightness of the picture. He then encounters a disproportionate increase in carbon-burning rate, often beyond the feed rate of the arc control mechanism. Operation then becomes critical and efforts at manual control prevent the arc from establishing itself on a stable basis.

There has been a tendency, particularly on the West Coast, to increase the picture size without adding to the illuminations, whereupon a reduction in brightness and contrast results. Graininess is also noticeable, and all these factors lessen the value of the front rows of seats.

Operating Difficulties

Operating difficulties may be encountered with the rotating high-intensity lamp, due to pitted or burned contact brushes, loose and dirty lead connections, excessive voltage at the arc. The carbon manufacturers' specifications should be rigidly followed. The lamp house should be ventilated, if possible, with a separate exhaust fan, and dampers put into the stack in such a manner as to control the travel of air without impeding the passage of waste materials of arc combustion.

The *Suprex* and the 1-kw types of non-rotating high-intensity lamps are operated at small arc voltage and current. Hence, they are sensitive to drafts.

The final phase of motion picture production is in the theatre, and the success of this phase depends upon the technique of projection and the condition of the projection equipment.

This article discusses in considerable detail the importance of proper maintenance, the types of light-sources, and other factors of importance to good projection.

† J. Soc. Mot. Pic. Eng., Aug. 1943.

Modern lamp houses are designed to have sufficient ventilation under ordinary conditions, but close control of the amount of air passing through the lamp houses into the stack is essential for trouble-free operation.

Abnormal draft is caused by excessive ventilation of the projection room, back-draft from certain types of rear shutters having cooling fins, and down drafts from chimneys lacking forced-draft ventilation. Excessive draft, unless very strong, does not usually cause flickering, but it does cause a movement of the arc flame, which becomes noticeable on the screen.

The non-rotating high-intensity arc, when properly burned, is almost rectangular in form, with the point of the tail flame directly above and not far behind the positive crater. If the tail flame wavers and is driven toward the front of the lamp house in an intermittent manner, excessive draft is usually indicated.

If it is not possible to control the draft with the stack damper, it may be necessary to restrict the ventilation entering the lamp house; or, if the trouble is caused by fins on the rear shutters, the fins may be removed. However, this procedure is not recommended, as the fins were installed to dissipate heat from the film and film-trap assembly.

It is suggested that the arc be protected by means of a heat-proof glass shield placed directly behind the rear shutters. It should be remembered, however, that adequate ventilation is necessary to protect the lamp house, and drafts should be restricted only to the point at which the arc will burn satisfactorily.

In order to maintain a rectangular arc shape, as described, it is necessary that the carbons be properly positioned, by raising and lowering the negative carbon until the gases are seen to escape from the top of the positive crater. For higher currents, the negative carbon tip should be slightly below the centerline of the positive, and in order to let the gases escape from the top of the crater, it may be necessary to allow the top of the positive crater to burn back as much as 0.32 inch.

Anything that distrubs the normal position or function of the arc, such as some types of carbon savers, or by burning the carbons too short, may result in screen discoloration, light reduction, or change in light distribution.

The optical system of the non-rotating high-intensity lamp is designed by the manufacturer to deliver the maximum amount of light, and the arc should be operated in a given position with respect to the mirror. Moving the positive crater toward the mirror 0.10 inch from its proper distance will result in a decrease in screen illumination of approximately 40 per cent when using a 7-mm positive carbon.

In order to avoid noticeable screen color difference, the arc should be struck three or four minutes before the change-over period and the position of the image of the positive crater should be adjusted before, not after, the change-over. In many theatres where false economy prevails, projectionists are instructed never to strike the arc on the incoming projector until the last minute. With this procedure, screen results are bound to suffer.

Lighting Problems

When illumination trouble occurs it is necessary to locate it with a minimum of delay. Unfortunately, it is often difficult to determine immediately whether or not the carbons are at fault, and some projectionists keep a few trims in a dry place to be used as a check. Later, if trouble occurs, carbons being currently used are checked against these reserves. If the trouble persists, one may look elsewhere for it, such as in the current supply or in the condition of the draft. Rarely are the carbons found to be at fault.

With the releasing of productions on fine-grain stock, hopes were entertained that some of the lighting problems would be lessened. Experience in this respect has been, to say the least, very disappointing. The greater brilliance and contrast are readily apparent, but the stock used so far has a tendency to buckle. The phenomenon is very curious: it comes and it goes. A print may be used for a few days without trouble; then, for no apparent reason, the picture on the screen begins to weave in and out of focus. In other words, the photographic image will be out of focus.

The modern projector is designed to be adaptable to all types of theatres. There are, however, many mechanisms now in use, particularly in circuit houses, that should have been discarded years ago. Worn film-tracks and hooked sprockets are found in many of them, which are the causes of film damage in alarming proportions. Many projectionists have adopted the practice of speeding up their electric rewinds beyond the limits set by the manufacturers. This causes many fine scratches on the surface of the film, commonly called "rain," and should not be tolerated.

It is difficult to understand why so many owners and managers will not hesitate to make large expenditures on new marquees, carpets, chairs, and on the general beautifying of the auditorium, all of which can not be fully appreciated in the dark, but neglect to maintain properly the most vital part of their theatre—the projection equipment.

The screen is allowed to become dirty and discolored. There are many methods of so-called resurfacing; few have proved satisfactory. The best procedure is to try to keep the surface and perforations free from dust and dirt. When discoloration does take place, the screen should be replaced. The difference in cost between an ordinary resurfacing job and a new screen is not comparatively great.

Many of the older theatres were constructed during the days of vaudeville and

(Continued on page 25)

Presenting: Orin M. Jacobson

ORIN M. JACOBSON. Born November 28, 1891, in Marinette, Wis. Family moved to Tacoma, Wash., in 1897. After graduating from Tacoma High School went to work as marine fireman to satisfy yen to become an engineer. Evidently found an engineer's career not to his liking, for one year later he returned to Tacoma where the lure of the theatre got him.

Became an apprentice projectionist at the old Bijou Theatre in 1910, working at that time with a No. 5 Powers machine and using two garbage cans for take-ups. Joined Local No. 175 in July, 1910, and since then has served in every office of the organization from sergeant-at-arms to president. Since 1919, he has been a delegate to all I. A. Conventions. Has been secretary of District Number One since 1926, and in 1930, was appointed I. A. representative by William F. Canavan, an office he still holds.

His hobby is editing and publishing the District Quarterly Bulletin. Married and has a daughter and one grandson.

This is the sixth in our series of who's who in the projection world. From time to time, I. P. will present to its readers brief word portraits of leading figures in the craft.—Ed.

Mixing Circuits in Public Address Systems

By *LEROY CHADBOURNE*

IN PUBLIC ADDRESS systems a volume control is required for each microphone and the setting of one volume control must not affect the setting of any other. In other words, if more or less volume is required from any one or more of the microphones it must be possible to obtain such regulation by operating the volume control associated with the particular microphone involved without the necessity of adjusting any of the other controls. Furthermore, control of the combined outputs of the microphones is necessary for best results. This volume control commonly is called the master gain control. The term "mixer" is applied to the cabinet in which the individual controls and master gain control are mounted.

The mixing circuit performs three functions: (1) to combine the outputs of several microphones into a single channel; (2) to provide a means for independently controlling the volume of each, and (3) to regulate the combined outputs.

The individual control may be connected directly after the microphone, in which case we have what is called low level mixing, or the microphone output may be connected to the input of a voltage amplifier, known as a p.a. amplifier. In this case we have high level mixing as the volume control is connected across the output of the amplifier. With either type of mixing, the functions of the mixer are the same and similar design considerations apply with this exception. In low level mixing the volume control is in an extremely low level circuit and the possibility of noise pickup from the operation of the control is much greater.

Operating Requirements

The fundamental operating requirements for a mixer are simple; it must afford the control essential to the production of programs and it must satisfy the electrical requirements of other parts of the system in which it is used. The factors which enter into any specific design, however, are many, and the principal ones are: number of input channels, insertion loss, impedance considerations, control range, interaction of circuits, leakage and susceptibility to noise pickup and frequency response.

The number of input channels required determines, to a degree, the circuit design, since some designs are more suitable for a limited number of channels. The most common number may be said to be four, but circuits having six and eight channels sometimes are necessary and so require consideration. In any given circuit the number of channels may affect the insertion loss.

The insertion or transmission loss, due to the connection of the volume control in the circuit, has a definite minimum value determined by the type of circuit, the type of control potentiometers used, and the number of channels. In determining the total gain required in the associated amplifiers the mixer insertion loss has a definite bearing on the signal to noise ratio of which the over-all system is capable.

Across the terminals of any resistance exists a small voltage containing components of every conceivable frequency, which is caused by the effect known as "thermal agitation". Its magnitude in the normal audio-frequency range represents an apparent power level of about —140 db in the resistance, referred to .006 watts. When amplified sufficiently and reproduced as sound this thermal agitation voltage appears as a hissing noise which is often referred to as tube "hiss".

Thermal noise is a property inherent in the atomic structure of all materials and it cannot, therefore, be reduced or controlled by any practical means, like noise from other sources. The internal resistance of a microphone is thus, in itself, a noise generator. Because the apparent power level of thermal noise is a constant under ordinary conditions, the signal-to-noise ratio at the output of the microphone is fixed by the signal level.

The conclusion may logically be drawn that only high quality microphones, with a low noise level should be used if quality reproduction is desired.

It is well known that a volume control consists of an adjustable resistance. The design may be simple as in the ordinary potentiometer, in which case the impedance is not constant, or it may be more and more complicated (as dictated by the circuit conditions) to arrive at a constant impedance condition no matter what the setting is.

The resistances in a mixer also generate thermal noise, which is present in the mixer output at the same level of about —140 db. If the signal and noise from a microphone are fed through a mixer the signal will be attenuated by the mixer loss and the noise after being attenuated will be obscured by the noise generated in the mixer itself. The thermal noise at the output of a low-level mixer is, therefore, constant and the signal-to-noise ratio obtained at the microphone terminals will be reduced by an amount equal to the mixer loss.

Low Level vs. High Level Mixing

If, on the other hand, the signal and thermal noise from a microphone are fed through an amplifier they will be amplified equally, preserving the original ratio, assuming that the noise generated in the amplifier is too small to be of consequence. If the amplifier output is then fed through a mixer, the signal will be attenuated an amount equal to the mixer loss. This will also be true of the noise, except that the latter cannot be brought below the level of noise generated in the mixer.

If the original noise, after having been amplified, and then attenuated, is still at a level substantially above the noise generated in the mixer, the signal-to-noise ratio at the mixer output will be practically that delivered by the microphone.

This gain in noise ratio possible with pre-mixing amplifiers is the fundamental reason for using them. Its realization requires that the mixer loss under practical operating conditions be substantially less than the gain of the pre-mixing amplifier. The practicability of achieving the lowest mixing loss compatible with other requirements and the advantages of high level mixing are thus well established.

The internal impedance of the microphone and input impedance of the amplifier with which the mixer is to work determine the constants which the mixing circuit must have for minimum possible insertion loss. Abnormal frequency distortion and increased harmonic distortion may result if the conditions are not satisfied.

It is obvious that, when low level mixing is employed, the mixer must be de-

signed especially for the microphones to be used, since the impedance of the several types differ so widely. To secure minimum mixing loss, the input impedance of the mixing circuit facing each source should equal the source impedance, but considerable variation is often permissible.

A dynamic microphone ordinarily may be worked into any reasonable load resistance provided it is not less than the microphone impedance. In the case of a pre-mixing amplifier, a load impedance greatly different from the optimum, affects the frequency of the amplifier and may limit seriously the power output of the amplifier with tolerable harmonic distortion.

Control Range of 45 db Normal

In any mixing circuit the range of control available is determined in the design of the mixing controls. The controls in general use have a range of about 45 db, often supplemented by one or two large steps next to the "off" position. The "off" position should theoretically give infinite attenuation or complete cutoff. Actually this is impossible, partly because of the mutual impedance in the control and because its wiring cannot be reduced to zero and more often because of the presence of electrical leakage.

Completely independent operation of each mixing control is the ideal. While it is closely approached in some circuit designs some interaction of control functions is inevitable. The cause of this interaction, when present, is the use of a type of control whose output impedance varies with the setting. Such controls may, however, be used in some circuits without causing this effect.

The transmission of speech from a microphone to the power amplifier through stray capacitances or spurious couplings, not subject to control by the mixer, is called "leakage." Leakage limits the degree of cutoff obtainable when the controls are in "off" position. Since leakage is greater at the higher frequencies the result is "tinny" quality. The same forms of stray coupling, which give rise to leakage, also make the mixing circuit more vulnerable to noise pickup from stray currents flowing in the ground system. This sometimes causes troublesome power hum or, if the system is near a radio transmitter, radio-frequency pickup, resulting in cross-talk or singing.

Circuits which are entirely above ground potential are more subject to leakage and noise pickup caused by spurious coupling. Since a mixing circuit usually contains only resistances it should not affect directly the frequency response of the over-all system. Indirectly it may, however, through improper or widely varying terminal impedances, upset the normal frequency response of associated amplifiers. Appreciable leakage may give the system a rising response characteristic when the controls are set at near maximum attenuation. Proper design will minimize both of these defects.

There are a number of types of controls available. The type whose operation is easiest to analyze and which least affects the properties of the overall circuit is the most complicated in construction, while the types which are simpler and cheaper to build and which have, therefore, been more widely used, in general complicate the theoretical design of the circuit through the introduction of additional variable factors.

In order of their simplicity of application the principal types of controls are: (1) the variable "T"; (2) the ladder; (3) the compensated potentiometer, and (4) the simple potentiometer.

Types (2) and (3) are fundamentally interchangeable. The variable "T" control is so-called because the schematic form of the control appears like that letter. It has a shunt resistor and two series resistors, one either side of the junction with one end of the shunt resistor. In one form all three elements are variable and three sliders are required. In another form the two series arms are variable and the shunt resistor is tapped. As the two contacts are moved they connect to resistors in series

(*Continued on page* 29)

Projectionist a Potent Factor in Success of War Loan Drive

By HUBERT L. VOIGHT

WAR ACTIVITIES COMMITTEE, MOTION PICTURE INDUSTRY

EVERY projectionist in the nation was this week called upon by the War Activities Committee for assistance in driving the motion picture industry's phase of the Fourth War Loan to a smashing success.

In asking the projectionists to cooperate in the campaign, the war activities heads stressed the importance of the four trailers which will be released to all theatres, starting January 18, with the Ginger Rogers footage. This will be followed with a trailer in which Ann Sothern appears as Boxoffice Maisie, and Bob Hope in a serious war-bond appeal will appear in a third release. The fourth release, the United States Treasury Department Fourth War Loan technicolor shield, will be made available to each theatre participating in the drive.

Getting the trailers on the screen and keeping them there is a problem laid before America's projectionists. During the Third War Loan, it is reported, many trailers—shipped to theatres—were returned with seals unbroken. In some houses, trailers were exhibited one or two days, and taken off. In others, the sequence of trailer showings was not maintained for the greatest effectiveness.

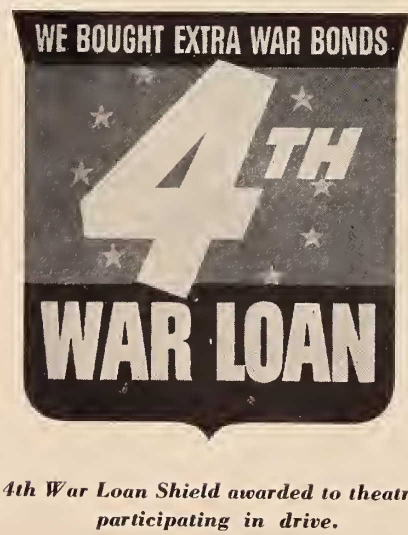
Practically every theatre in this country is expected to cooperate in the Fourth War Loan activities of the industry. "Sell a Bond for Every Seat" is the showman's slogan and goal. In this campaign, the projectionist is recognized as a potent factor to the success of the huge undertaking.

Get those trailers on your screen—and keep 'em there!

(ED'S NOTE: We wish to direct the attention of the gentlemen connected with the War Activities Committee, Motion Picture Industry, to a few pertinent facts regarding the return of unused trailers in the Third War Loan drive.

The showing of patriotic trailers in the majority of motion picture theatres depends solely upon the manager or owner of the theatre. Many theatre managers, not excepting those of the de luxe houses, are concerned chiefly with the reduction of operating costs and instruct their projectionists to "cut" the patriotic trailers so as to avoid any possible overtime charges.

Motion picture projectionists have at all times shown their willingness to cooperate with the authorities in the various war loan drives, and investigation will prove that in almost all cases where trailers were returned with unbroken seals the projectionists were not permitted to run them.)



4th War Loan Shield awarded to theatres participating in drive.


out of this fund of knowledge
MOTIOGRAPH'S ENGINEERING STAFF
M
THE WORLD'S OUTSTANDING INDUSTRIAL DESIGNERS
SUPPLY DEALERS' EXPERIENCE IN PROJECTION PRACTICE
OUTSIDE CONSULTING ENGINEERS
AMERICA'S MOST TALENTED PROJECTIONISTS
will come that great new post-war
MOTIOGRAPH PROJECTOR

IN THE SPOTLIGHT

By HARRY SHERMAN

AN IMPORTANT ruling was recently handed down by the Appeals Division of the War Labor Board overriding the regional War Labor Board's refusal to okay a wage contract between Local No. 344, Olympia, Wash., and the local theatre exhibitors, which stipulated that projectionists should be paid for preparatory time spent in a projection room. The decision of the Appeals Division reads as follows:

"On the basis of the new information submitted, the Appeals Division granted your appeal with the understanding that the operators actually report for work one half hour before the performance and perform the specific duties listed by you. The basis of this decision is that workers are entitled to straight time pay for such hours actually worked."

The officers of Local 344 are to be commended for their determined efforts to overcome the widespread practice among exhibitors of having their projectionists report for work from one half to one hour earlier than called for in their contracts so as to prepare the show for the day, without compensation for the extra time. The ruling of the Appeals Division sets an important precedent that should greatly interest all other I. A. locals throughout the country.

● Stanley Creech, Chief Petty Officer in the Canadian Navy and member of Local No. 348, Vancouver, Canada, paid us another of his surprise visits. For the past five years Stan has been roaming the high seas as a member of that daring band of men who make up the crews of the corvettes. He has seen plenty of action during that time, and although he is loath to speak of his own exploits, we understand that he has received several citations for bravery under fire. His son, just turned eighteen, has joined the United States Navy—sort of good neighbor policy, eh?

● Many of the de luxe New York motion picture theatres forgot their patriotism on New Year's Eve and boosted their admission prices to $2.20. Forgotten were the special rates they boasted of for service men and any soldier, sailor, or marine who wished to see a Broadway movie had to shell out $2.20 or keep moving. Well, $2.20 is a lot of money to pay for a movie that will be shown next week in a neighborhood theatre at a fraction of that price and very few men in uniform were seen at the Broadway theatres that night. No, sir, patriotism cannot compete with the box office till!

● The boys in Local No. 199, Detroit, want to advise all that are interested that Cleveland Local No. 160 is not the only union that is Masonically inclined. In proof of their claim they list the following officers of Daylight Lodge who are also members of 199: Phil Majeske, *senior warden;* Mike Badarak, *junior warden;* William Swistak (past master), *treasurer;* Walter Rickens, *senior deacon,* and Romulus Albu (past master), *chaplain.* Any others?

● Al Johnstone, I. A. representative, was in a huddle recently with Henry Link, Mobile, Ala., Sam Nelson, Jackson, Tenn., and Ed Ware of Pensacola, Fla. What's cooking?

● Maurice Rushworth, secretary of Local No. 181, Baltimore, Md., is doubling up on his duties as projectionist at the New Theatre by working as service engineer for RCA in his spare time. Rushworth was a pretty consistent winner in the recent I. P. Contest of Skill and Wits.

● On January 28 a testimonial dinner will be tendered to Mike Berkowitz, well-liked and genial president of the 25-30 Club of New York City. At the recent election, Mike and all the other officers were unanimously elected. Acting as counters and tellers at the election hall and trying to look very busy with not a vote to count were Bill Kunzmann, (National Carbon), P. A. McGuire (National-Simplex-Bludworth), Joe Abrams, and Bob Sanders.

● According to the latest records of the Census Bureau there are 23,875 projectionists in the United States, 22,355 of whom are employed and 1,520 unemployed. Why should there be any unemployed projectionists in this country—particularly when the cry of manpower shortage is so persistent?

These Census figures show that there is no manpower shortage in the projectionist craft. If this be true, what will the situation be when the war is over and thousands of army and navy trained projectionists flock to the theatres seeking jobs? NOW is the time for all local unions to lay their plans in preparation for the day when the two-man shift will become mandatory in every theatre in the country. NOW is the time for postwar planning that will protect the future of the craft.

● George Gerrard, projectionist at the Strand Theatre, Vancouver, Canada and member of Local No. 348, has been appointed representative for the Vancouver Civic Employees. He will serve as an arbitrator in the "closed shop" dispute now raging in that part of the country. Gerrard is also vice-president of the Vancouver Central Labor Union.

● Here is a tip to pass on to unorganized workers in our industry. At a press conference recently held in Washington, William H. Davis, Chairman of the War Labor Board, was asked how an unorganized worker could get a salary increase under the War Labor Board machinery. *"Well," replied Davis, "one way is to join an organization. That is the way I would do it."*

Just sound common sense, that's all.

● Harry Petty, Local No. 163, Louisville, Ky., was elected president of the Kentucky State Federation of Labor.

● We received a very interesting letter from one of our readers, Air Cadet Alvin B. Milchen, who is now stationed at Ellington Field, Texas, in which he describes his experiences and emotions while taking a high altitude test. It is particularly interesting in that the report was written in the decompression chamber and gives a graphic description of

Cadet Milchen's reaction to the test, as follows:

"This is an account of my ascent to 38,000 feet in a high altitude decompression chamber. I have just spent five minutes at 10,000 feet without oxygen and am going up to 18,000. At 18,000 now. Will spend twelve minutes here without oxygen. In military aviation, the air crew starts taking oxygen at 10,000 feet but since this is a test no masks are used at 18,000 feet. At this point some of us will suffer from anoxia—lack of oxygen. Anoxia has the same affect upon one as too much liquor.

"The higher up we go the less oxygen we have, with the result that we become drunker in our actions until we eventually pass out from lack of oxygen. As soon as the twelve minutes are up, we will put on our oxygen masks and the plane will ascend to 38,000 feet. Some of us will get varying degrees of aerombolism—which is very much like the divers bends.

"We have just adjusted our oxygen masks (at 18,000 feet) and we are breathing a mixture of oxygen and air; when we reach 30,000 feet altitude we will start breathing 100% pure oxygen. Going up now. It's hot in here. One of the fellows is going to be a guinea pig and see how high he can go without oxygen before collapsing. 20,000 feet now, no sensation yet. Fingernails turning blue. At 24,000 feet—still feeling fine. We are now at 28,000 feet—2,000 more feet to go and we will be breathing pure oxygen and not a mixture.

"Reached 34,000 feet and breathing pure oxygen—no pains from lack of pressure. We are now at 36,000 feet—2,000 more to go. Just hit 38,000 feet. We will spend fifteen minutes here and then descend to 30,000 feet where we will remain for one hour.

"My ears crack whenever I swallow. Descending—that is, going from low pressure at high altitude to high pressure at low altitude is harder on the ears than when ascending. There are several ways of equalizing the pressure when descending—swallow or yawn, or, if neither works, hold your nose, blow into it and swallow at the same time.

"If we were to remain here at 38,000 feet for longer than fifteen minutes some of us would get varying degrees of bends and not be adapted to flying at this height. As it is, one of the fellows sitting across the way was just taken out because he got a pretty severe attack of leg bends. As yet, I have no sensation whatsoever.

"We are now going down to 30,000 feet where we will spend one hour. While I am spending this hour I'll tell you of some of the natural physical reactions. First, there is a very strong tendency to belch and pass body gas. As you know, gas expands in low pressure and if you didn't pass gas you would get severe pains. At 18,000 feet the gas in your body requires twice as much room as at sea level, and at 38,000 feet it requires five times as much room. We have another fifteen minutes to go. The hour is up and we are now beginning our descent. Got to keep working on my ears.

"I'm writing this and what follows some time after the above related experience. I had to use pencil while in the chamber because the pen would leak in high altitude. On our way down to sea level one of the fellows had severe pains in his ears so we leveled off for a few minutes giving him a chance to blow hard on his nose, which partially cleared his ears.

"By the way, our guinea pig made it all the way up to 38,000 feet without oxygen and retained consciousness all the way. It is really unusual for a man to get that high without oxygen and remain conscious. Of course, as soon as we reached 38,000 feet a gas mask was put on our volunteer. All in all it was a great experience."

● For the 27th consecutive year Thad C. Barrows and James F. Burke, president and business agent, respectively, of Local No. 182, Boston, Mass., were reelected to office. The Barrows-Burke combine has successfully overcome anti-union opposition in their city, and today Local 182 is one of the best organized local unions in the Alliance.

● Tom Canavan, manager for Altec Service in St. Louis, and brother of former I. A. president Bill Canavan, was elected a "crew" member of the Variety Club. Tom should prove a valuable member to the club.

● The sudden death of "Mike" Conrow, president of Altec Corporation, was a shock to the industry. Mike was an honorary member of Local 306, and we first became acquainted with him in his early ERPI days. We always found him ready and eager to help anybody in trouble. He will be sorely missed by all who knew him.

● Abe Silverstein, member of Local No. 225, Atlanta, Ga., and projectionist at the Grand Theatre there, contributed to the happiness of the children of the Clark Howell School when he donated his services during the holiday week in presenting a show for their entertainment.

● Exhibitor Arthur Mayer, of the Rialto Theatre in New York City, is that rare being—an exhibitor who recognizes the efforts of his employees in helping to make the Rialto one of the most successful movie theatres in the country for showing his appreciation in tangible form.

Each employee who has been with the theatre more than five years was given a pension fund policy, the premiums of which will be paid by the theatre. The policy does not lapse when the insured leaves the employ of the theatre, but it may be kept in force providing he continues paying the low yearly premium. Or, if the employee prefers, he may receive a cash surrender value of the policy amounting to about $400 for each year the policy has been in effect. How many more exhibitors will follow Mayer's suit, we wonder. Your guess is as good as mine.

● Please do not send anonymous letters to this department for they will promptly be thrown in the waste-basket. We are very happy to answer all communications but they must be signed with the writer's name and address. All confidences will be respected.

● Local No. 370, Richmond, Va., has taken a step in the right direction. William Fox, projectionist member of that local has been appointed to the examining board for projectionists by the city fathers. It would serve the best interests of the craft if many more I. A. Locals followed suit.

I. A. Elections

L. U. 105, LONDON, CANADA

President, Sid Shaw; *vice-president*, William Hewitt; *secretary-treasurer*, Gar. McFadden; *business agent*, Harry McLean; *sergeant-at-arms*, William Shaw; *delegate to I. A. Convention*, Sidney Bradford; *trustees*, Harold Allaster, Newton Wallis and Fred Cripps.

L. U. 171, PITTSBURGH, PENNA.

President, George Engstler; *vice-president*, Irwin Turner; *secretary-treasurer*, Paul Mach; *business agent*, William Thompson; *executive board members*, Roy Grove, Dave Thomas, and John Urben; *trustees*, Henry Link, Sr., J. J. Clair, and Russell Kerr. Angelo Diodato was elected *sergeant-at-arms*, and J. W. Shawkey, George Engstler, and Danny Flask were elected *delegates to the I. A. Convention.*

L. U. 175, TACOMA, WASH.

President, G. R. Cameron; *recording-secretary*, A. F. Morse; *treasurer*, G. E. Manning, and Oren M. Jacobsen, *delegate to the I. A. Convention.*

L. U. 182, BOSTON, MASS.

President, Thad C. Barrows; *vice-president*, Bernard McGaffigan; *treasurer*, Joseph Rosen; *financial-secretary*, Albert Moulton; *business agent*, James F. Burke, and Joseph Ritchie, *sergeant-at-arms*. Joseph Nuzzolo, Harold Kaitz, and Walter Diehl, were elected *executive board members*. Thad C. Barrows, James F. Burke, and Louis Pirovano were elected *delegates to the I. A. Convention.*

L. U. 273, NEW HAVEN, CONN.

President, Morris Moriarity; *vice-president*, Frank Perry; *treasurer*, Ed. Boppert; *secretary*, Ernie De Grosse; *business agent*, Matthew Kennedy; *executive board*, Marcel Fasano and Nelson Frazier.

L. U. 303, HAMILTON, CANADA

President, A. V. DuFour; *vice-president*, H. M. Konkle; *secretary-treasurer*, Hugh J.

(*Continued on page* 30)

LETTERS TO THE EDITOR

Non-Intermittent Projectors

To the Editor of I. P.:

This is in answer to Eddie Whitford's query in the November 1943 issue of I. P. regarding non-intermittent projectors.

I distinctly recall the two Mechau projectors which were installed many years ago in the Capitol Theatre in New York City. I had the pleasure of seeing these projectors in operation and the late Art Smith, who was chief projectionist at that time, explained to me in detail the mechanical and optical phenomena.

The Mechau projector was a very heavy and rugged affair built for permanent installation. It was set level with the floor and the projection angle was taken care of by a tilted mirror—an arrangement similar to the one you will find today on the Brenkert F-7 effect machine. (Projectors mounted in this position will give longer life and enhance the performance of the carbon arc.)

The working parts of the projector were completely enclosed and bearing races were extensively used, thus making a nearly noiseless running projector. The lubrication was semi-automatic, and while the threading was a little different from the ordinary run of projectors, it was not complicated.

To get away from the one hundred per cent mechanical compensation for projecting a picture on the screen, the Mechau projector was outstanding in that this was accomplished by optical compensation. The light rays emanating from the light source were focused on a rectangular mirror, which, in turn, was reflected onto a prism located at the film aperture with another lens in between. An objective lens focused the illuminated image onto a train of eight sector mirrors which revolved around an axis at this point. The movement of the mirror train was properly coordinated with the film movement by a suitable mechanical arrangement.

Because the mirrors followed each other without any gap, parts of two sector mirrors were in the light beam at the same time. The first mirror compensated the one movement of a film picture, whereas the second mirror had already begun the compensation of the following picture. With every transition of a picture on the projected screen, the projection of two film pictures which followed each other occurred at the same time. This process went forward in such a manner that during every change of picture the mirror leaving the field got less and less light, and the mirror which was just entering the field got more and more light, so that the brightness of both pictures, which covered each other on the screen, was continuously changing. Their total brightness, however, remained the same.

A projected picture was thus replaced by the one immediately following without the dark interval, and the change of pictures correspond perfectly to the process as it took place in the human eye. This action was focused onto the tilted mirror with a Tele-objective lens.

The projected picture was viewed without eye strain and was absolutely flickerless at any speed. It was rock-steady and the definition was very pronounced, and had uniformity of illumination. The intensity and quality of the picture illumination was beyond criticism.

The Mechau projector produced a minimum amount of wear on the film due to the non-intermittent movement of the film, the extremely light aperture tension, light even tension take-up, and 32 sprocket teeth. Since very little heat passed through the film, buckling was eliminated.

Why these projectors did not get recognition, I do not know. Perhaps the price of $2400 for each projector had something to do with it.

Andrew J. Seeley
Local No. 376
Syracuse, N. Y.

Drive-In Theatres

To the Editor of I. P.

I have read your articles in I. P. for a number of years and have found them both instructive and interesting—keep on with the good work.

I should like to make a few comments on the article "Drive-In Theatres of the Past, Present and Future," by Leroy Chadbourne, which appeared in your November 1943 issue. By the way, drive-in theatres are unknown in Western Canada.

There seems to be difficulty in transmitting the sound to the cars, properly locating the horns, and annoyances with the plugs in the horns. It is here that I would like to suggest radio transmission with aerials overhead and receivers in the cars, probably dry battery operated.

Before the war I visited England and it was there that I first became acquainted with a "hard-of-hearing" set. Deaf patrons of theatres were supplied with earphones, each one of which had a cord attached to a small box. I believe these small boxes contained crystal detectors. With the aid of these "hard-of-hearing" sets, the deaf patrons sat in any part of the theatre and had no trouble in hearing the sound coming from the stage, or from any part of the theatre, as the aerials were installed under the carpets, and were wired to a high-frequency low-wattage radio transmitter fed from the main amplifier in the projection room.

With study and planning I think this could be adapted to the drive-in theatres.

Edward B. Marshall
Local No. 348
Vancouver, Canada

SHOWS GO ON "DOWN UNDER" DESPITE MANY HANDICAPS

The "circuit" now being operated in remote and rugged regions "down under" by Sergeant Bert Hinchley of the Australian Army is a really tough one, according to the Australian exhibitor, and if any exhibitor thinks he is having some tough going he will change his mind quickly when apprised of Hinchley's woes.

Sergeant Hinchley, who is in charge of cinema activities of the Australian Army Amenities Service in a northern area, is responsible for the operations of seven complete RCA Mobile Cinema Units which carry morale-building entertainment films to soldiers in even the most remote portions of a wide territory.

Some of the troubles of the "circuit" are set forth in the article, which cites, for one instance, that when a show is scheduled for troops stationed where no road transport is available, one of the outfits is mounted on a jeep and driven into the cargo hold of a plane to be flown to the site. When the site is reached the "theatre" must be set up, and if no suitable building is available, any reasonably flat out-of-door area, large enough to accommodate projection and sound equipment, audience and screen, may serve the purpose.

Workshops have been evolved and sound equipments are being serviced with such efficiency that shows are given regularly and compare favorably with those presented under normal conditions.

STRONG ELECTRIC DISTRIBUTING NEW HISTORIC BOOK TO TRADE

Believed to be the first book written on the history of the motion picture which breaks down the story into distinct sections dealing with the various phases of the industry, "Then and Now" is being distributed to exhibitors with the compliments of the Strong Electric Corporation, Toledo, manufacturers of projection arc lamps. The departmentalization plan was adopted in the belief that many persons are interested in one or two branches of the art and would not be inclined to read a history which treated with phases in which they are not concerned.

Production, projection equipment, exhibition, distribution, film productions, and the acting profession are handled in order, and as the six parallel stories unfold a more profound respect for the industry naturally is the result.

The work is profusely illustrated and will be of special interest to those who long have been identified with the business. Early studios are shown, as well as the first projectors and the earliest theatres. The book has been dedicated to War Bond sales and is signed by Harry H. Strong.

KEEP UP THE GOOD WORK WITH YOUR

VICTORY CARBONS

EXHIBITORS and projectionists across America are to be congratulated for their splendid contribution to the war effort by conserving and recovering much of the copper plating of their "National" Victory Carbons . . . copper that would have been completely lost but for their cooperation.

Naturally the copper coating on Victory Carbons is as thin as practicable, because copper is a vital war material. This calls for strict maintenance of arc current within the recommended range, and careful adjustment of the carbon feed ratio.

Satisfied theater audiences everywhere are testimony to the constant attention being given to the current and feed factors.

In addition, tons of copper drippings and copper plate stripped from carbon stubs have been turned back into production channels as your Government urged.

Your continued cooperation in saving copper is still of utmost importance, for copper needs go right on expanding as America's war production grows. You've done a splendid job. Keep up the good work!

As a reminder, check the table below for carbon trim and current values specified for your equipment. A bulletin describing completely the operation of the Victory High Intensity Carbons will be sent promptly on request. Write for it today.

★ ***BUY UNITED STATES WAR BONDS*** ★

The word "National" is the registered trade-mark of National Carbon Company, Inc.

RECOMMENDED TRIM AND RANGE OF ARC CURRENT FOR LAMPS USING COPPER COATED, HIGH INTENSITY, PROJECTOR CARBONS

Type of Arc	*Arc Current—Amperes*	*New Victory Carbons—Size and Type*
"1 Kw" High Intensity, A. C.	52-66	7 mm x 9 inch H.I., A. C. Carbons in both holders
"1 Kw" High Intensity, D. C.	40-42	7 mm x 12 inch or 14 inch "Suprex" Positive 6 mm x 9 inch "Orotip" C Negative
Simplified High Intensity, D. C. with *adjustable* feed ratio	42-45	7 mm x 12 inch or 14 inch "Suprex" Positive 6 mm x 9 inch "Orotip" C Negative
Simplified High Intensity, D. C. with *fixed* feed ratio	42-45	7 mm x 12 inch or 14 inch "Suprex" Positive 7 mm x 9 inch "Orotip" C Negative
Simplified High Intensity, D. C.	56-65	8 mm x 12 inch or 14 inch "Suprex" Positive 7 mm x 9 inch "Orotip" C Negative

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TELEVISION TODAY

IV.—The Iconoscope

By *JAMES FRANK, JR.*

THE SUCCESS or failure of a television system depends largely on the pick-up device which converts the light image into electrical signals, and the viewing arrangement transforming the electrical signals back into visible images. We have already mentioned that the RCA television system uses the Iconoscope for dissecting images. In this chapter we will explain the design and operation of the Iconoscope in its present form.

Historically, the development of any form of television had to await a means of converting a light signal into a corresponding electrical impulse. This step became possible through the discovery of the photo-conductive properties of selenium in 1873. Within two years after this discovery, Carey proposed to make use of the properties of selenium in the solution of the problem of television. His suggestion was to construct a mosaic consisting of a great number of selenium cells, in a sense imitating the retina of the human eye. These cells were to be connected to shutters or lamps in corresponding positions on a viewing board (see Figure 7).

Although the suggestion was made in 1875, the device was not put into operation until 1906 when Rignoux and Fournier used this arrangement to transmit simple patterns and letters. Their mosaic consisted of a checker-board of sixty-four selenium cells. Each cell was connected to a shutter on a viewing screen which was also made up of sixty-four elements in positions corresponding to those in the pick-up screen. When a picture was projected on the selenium cells the resistance of those illuminated decreased, allowing an electric current to flow which opened corresponding shutters on the viewing screen. A light behind these shutters made the reproduced picture visible.

The idea of dividing the picture into elements, converting the illumination on each element into electric current and sending the signal from each over individual wires is practical for a small number of divisions or picture elements and for transmission over short distance, but is useless as a means of producing pictures of the standard required of television today.

The next step was proposed by Nipkow in 1884. Instead of using individual wires connecting each picture element, he suggested sending the information from one element at a time over a single communication channel and then reassembling this information again at the viewing screen. This process was to be carried out at such a rate that the picture appeared continuous due to "persistence of vision."[1]

Scanning Principle Is Sound

The means proposed to accomplish this point-by-point transmission was the scanning disc. At the time of its invention the necessary technique of handling and amplifying small currents had not yet been developed so that it was a number of years before this scanning principle could be put to practical use. However, the principle was sound and the scanning principle has been the basis of all television systems since then.

While this development represents a great step forward, it was only attained at considerable expense of available picture signal. The loss is due to the fact that each element only contributes to the picture a small fraction of the total time, whereas with the first system suggested each element operated continuously.

To make this clear, consider again the simple sixty-four element mosaic used by Rignoux and Fournier. Each photoelectric element was connected to the viewing screen by a separate conductor and the picture to be transmitted projected continuously on all the elements, so that a signal current passed through every light sensitive element all the time. To reduce the scanning system to a comparable case, assume we have the same mosaic of sixty-four photosensitive elements, but that they are all connected to a common communication channel. The elements are covered with shutters (*i. e.* the scanning disc) which allow only the light from one element of the picture at a time to reach its corresponding photocell. These shutters are opened one at a time in rotation covering the entire picture twenty or thirty times a second. Thus, each light sensitive element is only operating for a fraction of the total time equal to one over the number of picture elements, in this case one-sixty-fourth of the time.

In order to regain this lost signal and yet retain the principle of scanning, the Iconoscope was developed. To illustrate the method of attack, consider again the sixty-four element array of photocells. Instead of scanning the elements with shutters, assume that each element is connected to the contact points of a switch which connects them in rotation to the main communication channel. Thus, the scanning is accomplished by means of a commutator switch.

So far, we have gained nothing over the previous method of scanning, but now if a condenser is placed across each of the photocells in such a way that it accumulates or stores the entire electric charge released by the action of the light during the time the element is not connected to the communication channel, this charge can be used when the commutator switch again makes contact with this element. Therefore, photo-electric current is being released continuously by every element and the charge is stored in the condenser belonging to that element until it is needed at the end of a scanning cycle.

The reduction of this principle to some practical form is obviously a difficult problem. The number of individual photocells and condensers for a television picture of suitable quality will be of the order of 250,000 units, and it is quite apparent that a screen composed of that many conventional photocells and condensers is out of the question.

The Iconoscope consisting of an electron gun and photosensitive mosaic enclosed in a highly evacuated glass envelope is the solution to this problem (Figures 8 and 9). It not only applies

[1] See footnote "Television Today." I. P., Nov. 1943, p. 27.

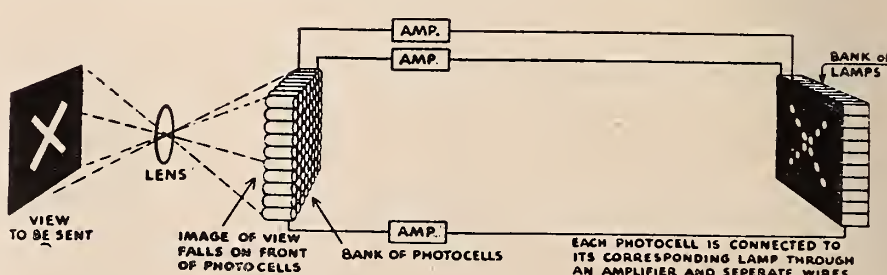


FIGURE 7. *Elements of the Carey system.*

FIGURE 8. *Iconoscope, the electric eye for television.*

the principle of storing the charge on each element of the mosaic for the entire picture time. but it also involves no mechanical moving parts.

The electron gun produces a narrow pencil of cathode rays which serves, as will be shown later, as a commutator to the tiny photocells on the mosaic. The gun is in reality a form of electron projector which concentrates the electrons from the cathode (the negative terminal or electrode of a circuit) onto the mosaic in a very small spot.

Electron Optical System

The electron optical system consists of two electron lenses which are formed by the cylindrically symmetrical electrostatic fields between the elements of the gun. Figure 10 shows diagrammatically the arrangement of this gun, together with the anodes which make up the electron lenses. Below this diagram is the approximate optical analogue. Details of the gun construction are as follows: The cathode is indirectly heated. The area which is coated with certain chemical compounds from which the electrons are emitted when heated is located at the tip of the cathode cylinder. It is mounted in the neck of the glass envelope so that the emitting area is a few thousandths of an inch in front of an aperture or opening in the control grid. A long cylinder with three defining apertures or openings whose axis coincides with that of the cathode cylinder and the control grid serves to give the electrons their initial acceleration. This is known as the first anode (positive terminal of a circuit).

It will be noted from the illustration that the electrons hitting the aperture partitions are not allowed to pass through. A second cylinder, also coaxial with the first anode (and cathode cylinder and control grid) and of somewhat greater diameter, serves as the second anode and gives the electrons their final velocity. The second anode is in general formed by applying a conductive coating to the neck of the Iconoscope bulb, as shown in Figure 9.

The gun used in the Iconoscope is designed so that it will concentrate a beam current of from one-half to one microampere into a spot about five mils (5/1000 inch) in diameter. Under ordinary operating conditions, a potential of about one thousand volts is applied between the cathode and the second anode and the voltage of the first anode adjusted until minimum spot size is obtained. The exact value of the beam current to be used will, of course, depend on the type of picture to be transmitted and the exact conditions of operation.

The beam from the gun is made to scan the mosaic in a series of parallel horizontal lines repeated at thirty cycles per second. This is accomplished by two sets of magnetic deflecting coils arranged in a suitable yoke and slipped over the neck of the Iconoscope. These sets of coils are driven by two special vacuum tube generators supplying deflecting currents described later.

The element which characterizes the Iconoscope is the mosaic. It consists of a vast number of photosensitive globules or minute particles mounted on a thin mica sheet in such a way that they are insulated from one another. The back of this sheet is coated with a conducting metallic film which serves as a signal plate and is connected to the input of the picture amplifier.

The appearance of the mosaic is shown in Figure 11. Such a mosaic may be formed in a number of ways. For the standard type of mosaic the silver globules are formed by reducing (releasing the oxygen, leaving pure metal) particles of silver oxide dusted over the mica. Under proper heat treatment the silver globules reduced from the oxide will not merge with one another but will form individual droplets. These droplets are sensitized after the mosaic has been mounted in the glass envelope and the envelope evacuated. The sensitization is similar to that used in the ordinary cesium photocell; that is, the silver is oxidized, exposed to cesium vapor, and then heat treated. The result is that the photo-electric response of these globules is about the same as that of a high vacuum cesium photo-electric cell, both in sensitivity and color response.

Tests indicate that the Iconoscope with a quartz window is sensitive from well into the infra-red portion of the light spectrum through the visible, and into the ultra-violet lighter portion. Glass

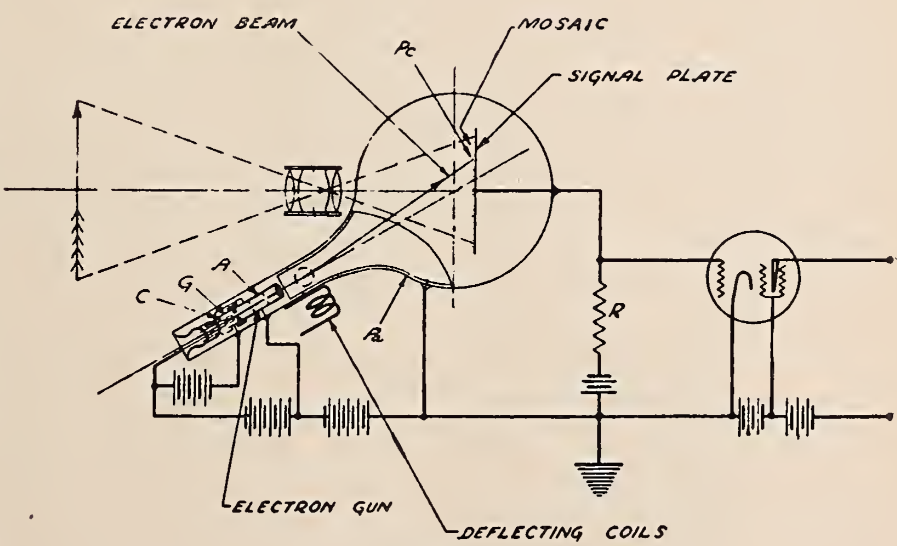


FIGURE 9.

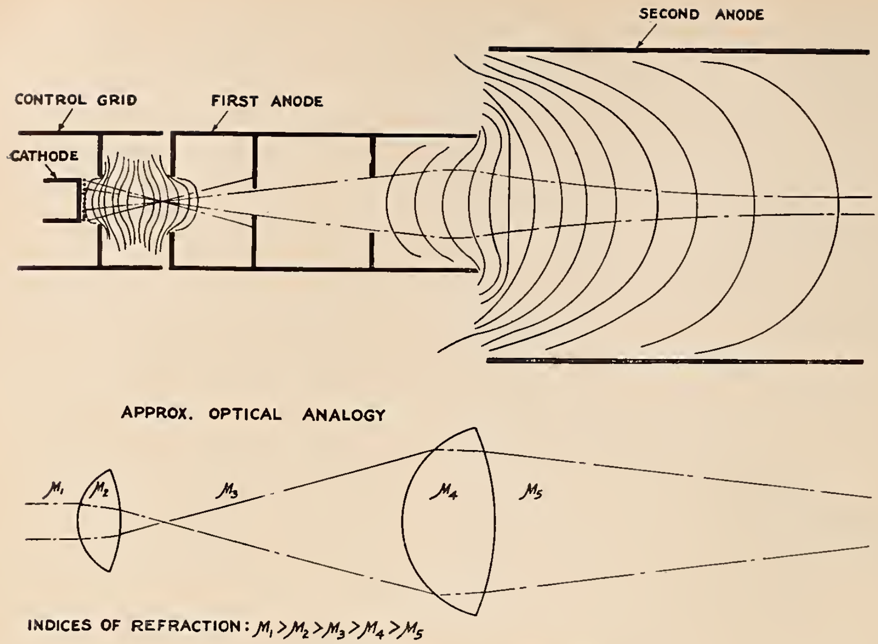


FIGURE 10. *Diagram of electron gun.*

walls used commercially absorb ultra-violet light.

The mica on which the silver droplets are mounted serves to insulate them from one another and furthermore is made thin enough so that the electrical capacity between each globule and the metallic signal plate on the other side of the mica sheet will be reasonably large. Mica is particularly well suited for this purpose due to the uniformity of cleavage sheets, excellent insulating properties, and other electrical characteristics.

The mosaic is mounted in the glass tube with the silver beads facing the electron beam. In order that the optical image of the scene to be transmitted may be accurately focused on its photosensitive surface, it is placed in the tube in such a way that the axis of the projection system, vertical to the plate, is at an angle of 30 degrees with the axis of the electron stream.

Essentially, the Iconoscope may be thought of as a plain mosaic made up of a great number of individual photocells, all connected by electrical capacity to the common signal plate and consecutively contacted by the scanning electron beam. The fundamental cycle of operation is as follows:

Every silver globule making up the mosaic is photosensitized so that when a light image is projected on the mosaic the light causes electrons of a number proportional to the light brilliance to be emitted from each illuminated minute size photosensitive area, which is a group of globules. The resulting loss of electrons leaves each minute photosensitive area at a positive potential without respect to its initial condition, which potential is then proportional to the number of electrons which have been released and conducted away. Thus the mosaic tends to go positive at a rate proportional to the light falling on it.

As the electron beam scans the mosaic, it passes over each element in regular order, releasing the charge it has acquired and driving it to equilibrium by restoring an equal number of electrons to the globules. Due to the fact that each element is coupled by capacity to the signal plate, the sudden change of charge of the elements will induce a change in charge on the signal plate and result in a current pulse in the signal lead connected to the amplifier.

The magnitude of these pulses will be proportional to the intensity of the light falling on the scanned element. Thus the signal output from the Iconoscope will consist of a chain of electric current pulses corresponding to the light distribution over the mosaic. This chain can be resynthesized or interpreted at the receiver into a reproduction of the original image, as will be described later.

To clarify this cycle the equivalent circuit representation of a single element is shown in Figure 12. The beam is represented by the switch and the series resistor *R*. This switch may be considered as being open except at such times as the beam is actually on the element. When the scanning beam moves off the element in its regular course, the photoemission from the element starts to charge the condenser *C*, the rate of accumulating charge being proportional to the illumination on the element.

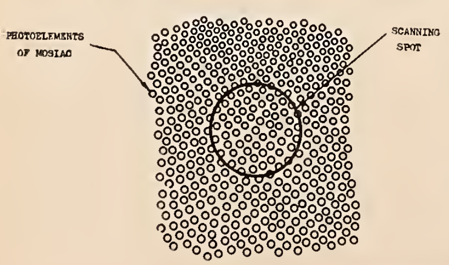
In the next scanning cycle, one thirtieth of a second later, the beam again sweeps over the element, closing the switch and discharging the element. During this discharging cycle the entire charge accumulated during the time the beam was not on the element must now flow through the input resistor R_1 generating a voltage which is applied to the input of the picture amplifier. It can thus be seen that a fluctuating current is sent to the picture amplifier from a huge number of similar circuits which is an interpretation of the distribution of light over the entire scene.

In designing the mosaic, it is evident that the time constant of the circuit discharging the condenser *C* must be small enough to allow it to fully discharge during the time the beam is on the element.

Iconoscope Pick-up Tube

The Iconoscope pick-up tube employs the storage principle in that the electrons are stored after they have been released from the mosaic globules until the mosaic is scanned by the electron beam. It is interesting to note that the voltage supplied to the amplifier by this storage system is greater than the equivalent voltage from a non-storage system by the ratio of the number of picture elements. You will recall that for present day pictures this was about 250,000 times. This is quite an important factor in the amount of amplification required.

In order to give a better pictorial idea of the conditions of the surface of the mosaic, Figure 13 is shown. It represents the appearance of the charged



(Left) FIGURE 11

FIGURE 12 *(Right)*

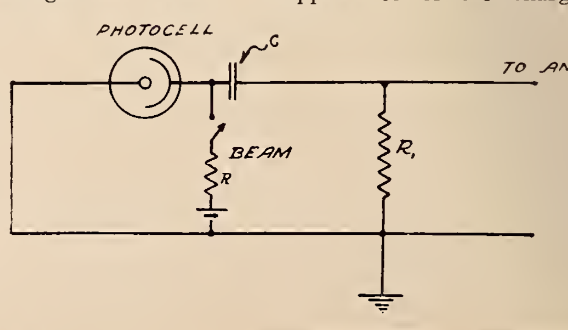


image on the mosaic if it were visible to the eye. The region just behind the scanning beam, the top of the mosaic, is in equilibrium potential since the emitted electrons have been restored to the globules by the beam, and therefore shows no visible image. It may be noted that the portion of the image just ahead of the scanning beam is of greatest intensity since it has had the longest time for charging.

The picture just drawn of the operation of the Iconoscope is very much simplified. A number of factors complicate this seemingly straightforward cycle. Among the most important of these complicating factors are the potential distribution over the mosaic and the redistribution of secondary electrons emitted from the elements under bombardment. Due to the fact that the potential or voltage between globules on the mosaic and the second anode, which collects the emitted secondary electrons, varies over the mosaic and due to the fact that some of the electrons emitted return to other portions of the mosaic instead of reaching the second anode, there is a loss of efficiency.

Taking into account the various factors tending to reduce the output of the Iconoscope, it is found that the net efficiency of conversion is in the neighborhood of 5 to 10%. In other words, the signal output is about 1/20th that which would be expected on the basis of the light flux reaching the mosaic, the saturated photoemission of the photo-electric elements, and the assumption that the entire photocurrent is stored by the mosaic. The efficiency of conversion is not constant but depends on the amount of light used. The efficiency is a maximum at low light and decreases as the light is increased.

It is interesting to note that the Iconoscope, taking into account its inefficiency and imperfections, is able to operate at one-tenth the light required by a perfect non-storage system, which includes an electron multiplier.

The resolution, that is, the capacity to show small details, especially to show as separate two points of light close together, of an Iconoscope may be limited either by the size of the photo-electric elements or by the size of the scanning beam. The size of the silver globules in the Iconoscope is many times smaller than a picture element (5 mils) so that many hundreds of them act together under the scanning spot. (See Figure 11.) The resolution is limited, therefore, by the spot size.

Sensitivity of Iconoscope

The sensitivity of the Iconoscope decreases with illumination. This is not wholly disadvantageous in that it permits the transmission of a wider range of contrast over a given electrical system than would otherwise be possible. In a sense, this is similar to the compressor-expander systems used in sound recording. The Iconoscope is an extremely sensitive and stable device for obtaining television transmission. Excellent and consistent results are obtained under widely varying conditions of operation. The practical lower limit to light which can be used to transmit a picture is set by the "noise" in the picture amplifier.

Measurements have been made to determine the illumination necessary for satisfactory operation. With an F/2.7 lens to focus the image on the mosaic, an average surface brilliancy of from 30 to 50 candles per square foot on the object viewed gives completely satisfactory transmission. A recognizable image can be obtained from a good Iconoscope with 8 candles per square foot using a F/16 lens; that is, with 1/150th the illumination mentioned above.

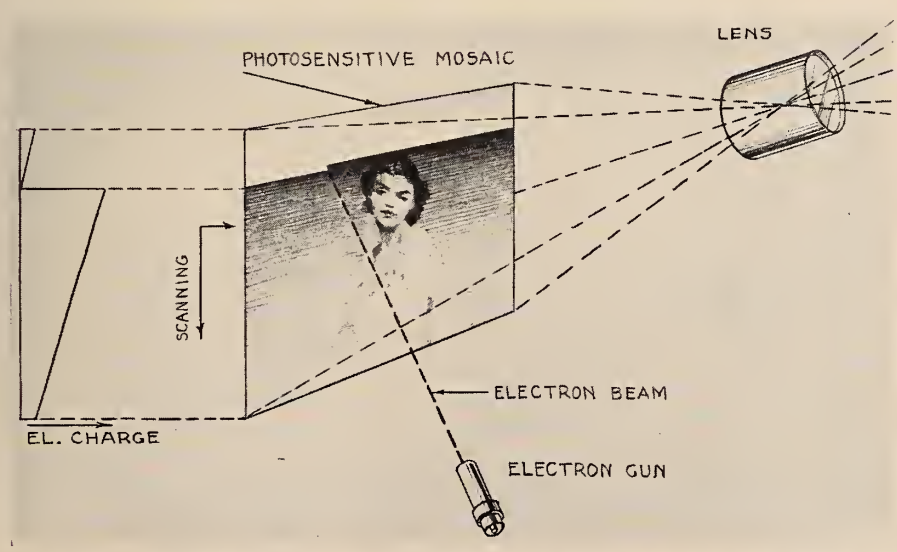


FIGURE 13. ***Pictorial idea of the conditions of mosaic surface. The appearance of the charged image on the mosaic is represented as if it were visible to the eye.***

Hints for New Sound Engineers

W. H. HOWARD

RCA SOUND SERVICE CO.

While the following suggestions may be obvious to any of the old-timers, it may be helpful to some of the new boys who have recently become field engineers.

Make a record of the length of time it takes to replace certain parts of the equipment, how long it takes when the parts do not fit properly or when something goes wrong. This will guide you when wishing to replace a part before the opening of a show or between reels.

Changing a sprocket, for instance, is a very simple matter but there are times when the old sprocket freezes on the shaft and also when the new sprocket holes do not fit the shaft. The same thing goes for pad roller arms and shafts. These are simple parts to put on and take off, but in many instances the set screws damage the shaft and it takes considerable time to remove it without breaking the arm.

Similarly, there are other items that could be replaced between changeovers. I have had occasion to change the anoil seal on a PS-24 soundhead between reels, replace a bearing on a motor, replace an intermittent movement, and I have also replaced a projector head between reels. Of course, it is not advisable to do these things in a theatre that does not like to have its show interrupted.

On the other hand it once took me three and one-half hours to replace the anoil seal on a PS-24 soundhead because it bound when first installed. Also, when replacing the old type oil seal with the new type seal it should be remembered that the armature position with the new seal is not quite the same, and the stationary section of the motor starting switch should be shimmed out a little with a couple of washers so as to make the motor start up satisfactorily.

50% OF WESTERN ELECTRIC'S WAR SALES SUB-CONTRACTED

Fifty per cent of Western Electric Company's total sales of war materials to the government since the United States entered the war has been produced by sub-contractors, according to a statement released by the company. In a report to the War Production Board and the Smaller War Plants Corporation, W. E. said that in meeting its commitments to the government it is doing business with more than 6,500 sub-contractors and suppliers.

W. E. set up a war production planning board a full year before the United States entered the war. A part of this planning took the form of a nation-wide survey to catalogue those allied communications factories that could be utilized as sub-contractors. Hundreds of such smaller factories were classified as to their manufacturing facilities, skilled personnel, location and probable capacities.

AT YOUR SERVICE

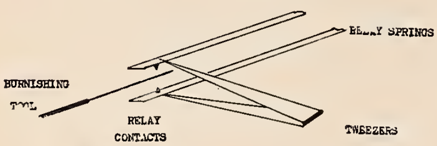
This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Marking Gears for Tooth Mesh Positions

Regardless of the hardness of the gear, it can be permanently "spotted" without using a punch. I use about an 8 mfd.. 450-volt capacitor, charge it fully then hold one lead against the gear proper and touch the other lead to the tooth to be marked. The discharging capacitor leaves a definite "pock" mark where desired.—R. H. Bisbee, *RCA*.

Cleaning Relay Contacts

A really good burnishing job can be done on relay contacts with the help of



a small pair of tweezers, as shown in the above diagram.—Dave Waddell, *RCA*.

Hint on Replacing Voice Coils

In replacing voice coils on permanent magnet speakers, I have often found iron filings in the air gap. When air pressure for blowing these filings out is not available, I found that any kind of sticky tape inserted in the air gap will pick up a considerable amount of this dirt.—P. H. Sohor, *RCA*.

Low Value Resistor Substitute

Where resistors of about ¼ to 5 ohms with fairly high current capacity are required, I use a strand of galvanized screen wire. Ordinary window screens are suitable for this purpose. The resistance is about 1 ohm for each 12 to 15″ of wire, depending upon the particular screen mesh.—R. H. Bisbee, *RCA*.

Emergency Operation for W.E. or Similar 18 Volt D.C. Motor Generator System

The ordinary rotary disk-shaped dimmers used in lighting circuits usually found lying around, especially in houses with stages, are just the things required. The usual run of these dimmers seem to be variable between 2 and 10 ohms, with a current carrying capacity of about 8 amperes. With arc generators of from 40 to 60 volts, a resistance of 2 to 3 ohms is required so that two dimmers in parallel are perfect for wattage and for resistance adjustment.

The ammeter on the horn field cabinet is an ideal guide in voltage adjustment. The voltage source must be constant. Connection should be made by large battery clips right to the brush gear of the arc generator, or at least to the high side of the arc line resistance. This setup is as good and stable as the original 18 volt generator. In an emergency in theatres with only two bulb type arc rectifiers, both arcs could be switched to one rectifier with consequent "stealing" of the arc and reserving the other rectifier for the 18 volt supply. Polarity, of course, must be watched.—R. W. Rushworth, *RCA*.

Magnetic Trouble-Light

Even though most trouble-lights are equipped with clips, it very often is difficult to attach them to places convenient to the work on hand. Here is one solution to that problem:

Get a small permanent magnetic slug from a PM speaker of small size and attach to it a flexible base lamp socket, the size bulb necessary to give enough light for the job, your favorite eye shade, enough cord to reach anywhere in the projection room, and you will have a trouble-light that will stick almost anyplace you put it—at any angle—just so long as there is a piece of metal to hold the magnetic slug.—C. R. Shepard, *RCA*.

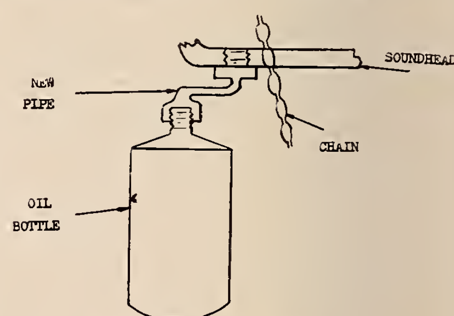
Tube Rectifier Adjustment

Complaints are sometimes made regarding the short life of rectifier bulbs, blame being placed on the tube itself when the real trouble was due to faulty operation. One instance was encountered where a projectionist who used to pull 50 amperes had reduced his arc current to 40 amperes, assuming he would save current and make his bulbs last longer. The design of the rectifier was such that it was to be used over a current range of from 50 to 65 amperes, so that at 40 amperes he had totally different operating conditions.

The filament voltage of a rectifier varies up and down as the arc amperage is changed. At 40 amperes the filament voltage was reduced to a point where there was no longer sufficient voltage on the filament to supply the necessary stream of electrons to carry the current between the positive and the negative elements since at this new voltage the supply of electrons on the surface of the filament was not replenished fast enough. In three months a flicker developed, and in another month the bulbs had to be replaced. The new bulbs cleared the flicker but in a few months it returned. Restoring the adjustment to the point where the arcs were pulling 50 amperes completely cleared this condition.—H. Prosser, *RCA*.

Clearing Take-Up Chain

When GoldE chain take-ups are used in conjunction with MI-9030 soundheads, it will be found that the oil collector bottle on the soundhead is in the chain path. A short piece of tubing with a



nipple threaded to fit the hole in the soundhead on one end, and a coupling to fit the oil bottle on the other end will not only correct this condition but will make a very neat job, as you will note from the diagram shown.—Dave Waddell, *RCA*.

Unnecessary Replacement of Amplifier Volume Controls

It is good practice to check the grid with a 20.000 ohms per volt d.c. meter before assuming the volume control to be defective. Coupling capacitors with relatively high leakage will cause good volume controls to be noisy when operated. In instances of more severity the maximum volume obtainable, (not normal) will result before full rotation of

(*Continued on page* 26)

PROJECTION OF MOT. PIC.

(*Continued from page* 12)

stage presentations. The picture was of secondary importance; consequently little if any attention was given to the planning of the projection room, which, with very few exceptions, were small and poorly ventilated. They were, in most cases, constructed high above the balcony to avoid the loss of seating space. The cost of redesigning them to present-day standards would be prohibitive.

Picture distortion and keystoning are present. Squaring the picture image by aperture-plate correction improves the general appearance, but the situation is a serious handicap to good projection. It is unfortunate that such conditions prevail in many of our first-run houses.

Notwithstanding these and many other factors, projection has for the most part improved steadily.

Recommendations Adopted

In 1936 the Research Council of the Academy of Motion Picture Arts & Sciences recommended the standard leader and the placing of dots in the upper right-hand corner of the composition for change-over cues. This practice was adopted by all the large producing companies, and provides a successful means of properly changing from one reel to another. Yet there are still some projectionists who deliberately deface the ends of reels with cues of their own design, such as punch marks or crosses scratched into the emulsion, all tending to impair the print and detract the audience's attention from the subject being reproduced upon the screen.

True, the laboratories do not provide standard cues on many short subjects, such as newsreels and trailers, and it is necessary that some sort of cue be provided. A small inexpensive cue-marker consisting of a template and a hardened steel scriber is recommended, for scribing a small circle at the upper right-hand corner of the film image, at exactly the spot where the standard dots would appear.

Conservation is all-important today, and replacement parts will not be obtainable. It is therefore urgent that equipment should be properly checked and adjusted. There is no reason why an intermittent sprocket should not last at least three years, provided it is of the manufacturer's specifications and the tension pads and shoes are properly adjusted. Excessive tension not only shortens the life of the sprockets, but also causes undue wear throughout the entire projector mechanism. One method of increasing the life of tension pads and shoes is to have them ground perfectly true and then chromium-plated. This also eliminates the tendency of new (or "green") film to stick while being projected.

Space herein does not permit a complete discussion of the many important units that tend to make up the modern projection room. Projection may be termed the bottle-neck of the industry, and there is much that can be done in the projection room to assist in placing upon the screen high-quality pictures reflecting the great amount of labor, art, and expense that went into the making of the production in the studio.

W. E. DECLARES DIVIDEND

At a meeting of the directors of the Western Electric Company held last month, a dividend of 50 cents per share on its common stock was declared. The dividend became payable on December 30, 1943, to stock of record at the close of business on December 23, 1943.

NEW HIGH FOR RKO PROFITS

N. Peter Rathvon, president of RKO, issued a statement in which he reported that for the 39 weeks ended October 2, 1943, the gross profits, before reserves and depreciation, for RKO and subsidiaries were $11,914,106.39 as compared with $2,302,210.91 for the comparable period of 1942.

AT YOUR SERVICE

(*Continued from page 24*)

control is reached. Advancing control beyond maximum volume will invariably cause distortion, the reason for this is that the grid is worked more and still more positive.

Four instances have been encountered recently, similar in character, where the coupling capacitors contained approximately 10 megohms leakage. In one instance, the capacitor contained no high degree of leakage until after the amplifier had been in operation for at least five hours; increased temperature affected the condition.—D. E. HOWARD, *RCA*.

Conservation of Motor Starting Switches

One bad practice encountered and as yet not mentioned in the "At Your Service" columns is that of running down a few frames of film with the aid of the motor switch. This is due to the fact that the projectionist is not always familiar with what takes place in the switch box.

An extreme starting condition may impose a drain of 25 or 30 amperes, or more, on the line. As the motor starts reactions between the rotor and stator inductors introduce inverse voltages which subtract from the imposed voltages and cause an increasingly lower current as the speed increases, until some three or four amperes are consumed. Just before this point is reached, the centrifugal switch opens up the circuit through the starter windings.

To open a circuit carrying a current well within the capacity of the switch, the motor must at least come up almost to its full speed. A few frames movement of the film should be obtained by the handwheel—it is there for that purpose. This will considerably prolong the life of motor switches.—A. F. SCHNEIDER, *RCA*.

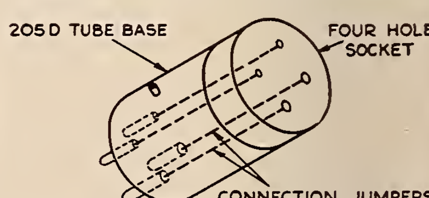
Electric Drill for Emergency Work

When in need of a mandrel for polishing or sanding something in an electric drill and the proper size is not available, a drill may be built up to the needed size by wrapping it with scotch tape. The tape is soft and compresses as work is forced on it.—R. S. SEAR, *RCA*.

Using RCA-80 Type Rectifier Tubes in 42-A Amplifier

Two RCA type Radiotrons may be used to replace the two WE 205-D vacuum tubes in the rectifier socket of the WE type 42 amplifier. When such a substitution is made, a higher voltage is obtained at the *B* supply output supplying PEC voltage 90 volts to the film amplifier and the type 41 amplifier as well as to the 42 type amplifier itself. The net result is a gain of about 3 db overall.

Due to the construction of existing sockets for the 205-D tube, pins must be installed on each RCA-80 tube instead of



replacing the sockets themselves. To avoid this inconvenience, I have constructed adapters. I procured standard four-hole sockets which fit snugly into the base of an old 205-D tube (the glass envelope and elements removed and the base cleaned of cement). Wire jumpers are then soldered to corresponding pins of the socket and the tube base (see diagram above); Duco cement is then used to mechanically fix the socket in the base.

Thus, by inserting an RCA-80 combination in the socket of the adapter and the

adapter RCA-80 combination in the amplifier socket, we have an equivalent of a 205-D tube with improved operating conditions. We have not altered the amplifier circuit in any way.—Joe Weiss, *RCA*.

Improving Exciter Lamp Bracket Studs On Simplex SH-1000 Series Soundheads

These studs have a small offset in the top stud towards the front which is supposed to make contact with a detent on the exciter lamp bracket spring and, of course, the object is to secure contact. However, as exciter lamp current of some six amperes has to pass through this minute contact point, oxidation sets in over a period of time. As a consequence, poor contact and sometimes intermittent operation of the exciter lamp will result from this condition.

This condition may be corrected by using acid core solder and soldering the small offset in the stud to the level of the remaining portion of the stud and smoothing the surface with an abrasive, thus assuring a good and steady contact.—R. W. Amos, *RCA*.

Emergency Arc Light Switch

As an emergency measure to assist in the elimination of fire hazard from film pile-ups in projectors, two changeover kick switches may be installed at the rewind bench (or some other convenient spot) for the purpose of quickly cutting the light from the projector in which the pile-up occurs. These kick switches may be of the same type as those used on automatic changeovers and should be wired in parallel with the present switches; one for each machine and should be plainly marked numbers one and two. In the event of an emergency, kick the proper switch so as to cut the light off and then proceed to the projector to clear up the trouble.—C. R. Shepard, *RCA*.

Marking Fuses

In a number of instances it has been found that small fuses in series with capacitors have been exchanged in some manner for larger values that afford no protection to the circuit involved. In order to prevent such an error, or at least to make it apparent, the following method has been proven effective:

Secure several small bottles of various colored lacquers and when checking fuses paint a small band of color around the glass portion, marking the fuse holder with the same color. The spare fuses in the projection room are also marked with the same coding.—K. E. Stephenson, *RCA*.

Addition to Simplex AM-101 Cabinet

A small metal box 6″ x 4″ x 2″ may be made up and mounted below the Simplex AM-101 Cabinets by a bolt through the bottom of the cabinet. This box will serve as a receptacle for a small piece of cloth used to wipe the film trap of the projector, and will also act as a stop to prevent the amplifier from opening all the way. The amplifier opens so as to stand out perpendicular to the wall and can be worked on more easily.—R. S. Sear, *RCA*.

Conservation of Parts

In the event of a worn shaft on the sound control unit MI-9702 on the sound changeover assembly, a satisfactory repair can be made by interchanging the worn unit with the fader volume control shaft and bevel gear. The parts are identical and as the fader control shaft and bearing assembly has a lighter task to perform, it is less frequently used.—A. Gaminet, *RCA*.

(*Continued on next page*)

CLIFF WELCH AUTHOR OF DECIBEL ARTICLE

Cliff Welch, of RCA, is the author of the article, "Water Analogy of the Decibel," which appeared in the November, 1943, issue of International Projectionist. Through an oversight his name inadvertently was omitted. The article, a thorough study of the subject, entailed a great amount of time and work on the part of Mr. Welch.

Conservation of Tungar Bulbs

Tungar bulbs that give low output or poor regulation on output often can be corrected by changing the tap on the power transformer so as to increase the voltage. Useful life of many discarded bulbs can be greatly extended in this manner.—A. C. Holland, *RCA.*

Emergency Operation of Power Unit

The output of the power unit had risen considerably so that the filament current of the exciter lamps could not be brought down to the normal current. This trouble in the unit was traced to a burned-out bleeder resistor, a five-ohm 100-watt wire wound unit. Since a replacement was not immediately available, a series of five exciter lamps was connected across the output of the power unit. This brought the voltmeter reading to its normal nine volts, and the exciter lamp current down to five amperes at an a.c. line voltage of 118 volts until the resistor could be replaced.—P. N. Connet, *RCA.*

Adjustment of Optical Systems

In making rotational adjustments of optical barrels, throwing the optical out of focus to bring a number of lines into view in the field, will give a clearer set of lines if the lens is moved so as to pass through the film before crossing at the slit image rather than forming the slit image before cutting the film.—A. F. Schneider, *RCA.*

Warns of Tuberculosis Inroads During War

War and tuberculosis go together, according to Dr. Iago Galdston, executive secretary of the Medical Information Bureau of the New York Academy of Medicine, and if we are to profit by past experiences we must redouble our guard.

After pointing to headway made by tuberculosis during the last war, Dr. Galdston said that "one of the most important weapons in the war against tuberculosis is the X-ray. Every young person going to work for the first time should have his or her lungs X-rayed. Of equal importance are the day-in, day-out living habits, principally good and adequate food and sufficient rest.

"To be on double guard everyone should know the signs and symptoms of tuberculosis: loss of weight, a 'cold' that hangs on, a tiredness you can't get rid of, fever, spitting blood. The presence of any one of these does not necessarily mean that the individual has tuberculosis, but each of the symptoms should be investigated.

"In these days of intensive war effort every man, woman and child counts. We need all the health and vitality we can muster. We cannot afford to gamble with or waste manpower."

C. R. UNDERHILL PROMOTED TO RCA HOME OFFICE

Charles R. Underhill, Jr., RCA service representative in Pittsburgh for the past sixteen years, has been advanced to the home office staff of the organization's theatre equipment section in Camden, N. J. Mr. Underhill is in charge of the company's motion picture screen activities. He was Pittsburgh district service manager for the past six years and prior to that was a service engineer in the Pittsburgh district.

MIXING CIRCUITS

(Continued from page 14)

with a connection to the several taps on the shunt element.

The third form and the most commonly used commercial type is known as the bridged "T". Here two sliders are required, one varying the shunt arm and the other a resistor connected across both series arms. If the basic mixing circuit provides terminal impedances to match the sources and load, the insertion of properly designed "T" controls gives a complete mixer whose terminal impedances will be constant regardless of the control settings.

The Ladder Control

The "ladder" type derives its name again from the appearance of the schematic. Basically it consists of the required number of sections consisting of a series and a shunt resistor per section, the sections being connected in tandem. One slider only is required. Aside from its use in series circuits where the load impedance can be made very high, substitution of this type for the "T" type will increase the minimum mixer loss at least 3 db, resulting in widely varying input impedance or a considerable interaction between channel controls. In spite of its inherent disadvantages it is rather generally used because of its lower cost and smaller size.

The compensated potentiometer is an improvement over the simple potentiometer, with which we are all familiar. Picture a step or contact type of simple potentiometer, which has contact studs with which the slider makes contact. Then between each contact stud and the tap on the potentiometer winding insert a resistor and you have the compensated type.

It always gives a variable impedance from the slider side, and the terminal impedance viewed from the other side likewise is variable unless the load connected to the slider is of high impedance. Consequently this type is of little use in mixing circuits. Its most familiar use is in amplifiers where its slider is connected to the grid of a vacuum tube. Here the input impedance is substantially constant and variations in output impedance do not matter.

The noise introduced into a mixing circuit by the operation of the sliding contacts is distinct from the thermal noise previously discussed. Its principal causes are thermoelectric voltage generated by the contact of dissimilar metals, dirt or products of corrosion on the contacts which cause undue variation in contact pressure and possibly some obscure property inherent in the crystalline structure of the contact metals themselves.

Contact noise trouble is much less prevalent in high level mixers, due to the smaller amount of amplification following the mixer. Mixers are now available with contact noise of the same order as the thermal noise in the resistors.

With properly designed modern controls the elimination of troublesome contact noise is largely a matter of keeping the contacts clean and properly lubricated. In this connection lubrication

(Continued on next page)

ALTEC NOTES

Lane J. Patton has been promoted from New York supervisor to branch manager of New York Eastern district, it is announced by G. L. Carrington, president of Altec Service Corporation.

R. A. Quinn has been appointed branch manager of the Los Angeles district of Altec. Mr. Quinn—"Bob" to his host of exhibitor friends on the West Coast—was ten years with Electrical Research Products, Inc , and his six with Altec makes him well qualified to carry on in his new responsibilities.

E. O. Wilschke has been appointed plant manager of the McKinley Avenue plant. He is well known throughout the East in the amusement world, and formerly was Philadelphia district manager.

I. A. ELECTIONS

(*Continued from page* 17)

Sedgwick; *business agent,* Gordon Freeman; *executive board members,* D. R. Cairns, H. F. Usher and H. W. Thornberry.

L. U. 306, NEW YORK, N. Y.

President, Herman Gelber; *vice-president,* Harry E. Storin; *recording-secretary,* Nathaniel Doragoff; *financial-secretary,* Charles Beckman; *treasurer,* James Ambrosio; *New York business agent,* Morris Kravitz; *Brooklyn business agent,* Ben Scher, and Frank E. Miller, *sergeant-at-arms. Board of trustees,* Dave Garden, Max Horowitz, and George Magarian; *New York executive board,* Dick Cancellare, Arthur J. Costigan, Charles F. Eichhorn, Sam Kaplan, Sam Salvino, and Cpl. Izzy Schwartz; *Brooklyn executive board,* Harry Garfman, Ernie Lang, Ben Morel, and Eddie Stewart; *sick committee,* Abe Kessler (*chairman*), Max Rosenberg (*secretary*) Max Aidicoff, Alex Becker, and J. J. Caravella; members of the *retirement board* are Mike Berkowitz (*chairman*), Louis Boritz, Sam Kirschenbaum, Morris Klapholz, Dave Narcey and William Salkey.

L. U. 348, VANCOUVER, CANADA

President, R. G. Pollock; *vice-president,* R. McEwan; *secretary,* J. H. (Hank) Leslie; *treasurer,* V. D. Brewer; *business agent,* J. R. Foster; *delegates to I. A. Convention,* V. D. Brewer, R. G. Pollock, and J. H. Leslie.

L. U. 401, CENTRALIA, WASH.

President, C. L. Leach; *vice-president,* C. E. Staples; *secretary-treasurer,* Charles Wheeler, and *business agent,* Jack Cunlisk.

L. U. 432, PETERBORO, CANADA

President, Melville Morgan; *vice-president,* C. B. Clute; *secretary-treasurer,* T. J. Stenton; *business agent,* Pryce Adamson, and *recording-secretary,* C. L. Newton.

L. U. 440, ST. JOHN, CANADA

President, Aubrey C. Sprague; *vice-president,* Louis J. McCourt; *recording-secretary,* Gordon L. Bridge; *treasurer,* Rennie J. Foulds, and Jim Whitebone, *business agent.*

L. U. 735, MT. CLEMONS, MICH.

President, Bert Penzien; *vice-president,* Ralph Brough; *secretary, Roy Suckling*; *treasurer,* Fred Devantier; *business agent,* Dan Deffenbaugh; *sergeant-at-arms,* John Baker, and *delegate to the I. A. Convention,* Dan Deffenbaugh.

CARRINGTON SUCCEEDS THE LATE "MIKE" CONROW AS ALTEC HEAD

G. L. Carrington was elected president of Altec Service Corporation to succeed the late L. W. "Mike" Conrow who died last month after a short illness.

H. M. Bessey, who formerly served as secretary-treasurer for the corporation, was elected vice-president.

One of the founders of Altec, Carrington has served as vice-president and general manager of this organization since its formation in 1937. In addition to his new duties as president, he also retains the post of general manager of Altec Service as well as the presidency of Altec Lansing, west coast manufacturing subsidiary.

Bessey is a director of the Altec companies as well as an officer of Altec Lansing Corporation. He is widely known throughout the motion picture field.

MIXING CIRCUITS

(*Continued from preceding page*)

always must be applied sparingly. It naturally tends to pick up dirt and dust which may form a conducting path. Furthermore any excess may tend to flow and so creep toward adjacent contacts and thus the leakage condition referred to above is aggravated. Ladder type controls, when used with the slider toward the source, have a unique advantage over other types in that any noise that may be generated by the contacts is attenuated by the loss in the control. As the attenuation setting is increased the contact noise is then decreased along with the volume.

These notes on mixers in p.a. systems are not intended to go far enough to enable the consideration of any type of design, but rather to bring to light a few of the basic principles involved in providing a proper mixer for the application.

Furthermore it emphasizes what many of us do know, and that is that the mixer performs a complicated electrical function in contrast to the control of the filament current in some of the earlier sound systems when batteries were used. Just any volume control cannot be used for a mixer if real results are desired. Since these units are complicated it means that they are not rugged enough to stand all kinds of abuse, should be handled carefully, kept clean, and inspected regularly to make sure that they will continue to function as intended.

A PLEDGE FOR '44

from the

Distributors of Simplex Equipment

★ As distributors of Simplex Equipment, we have always had a keen sense of responsibility to you who have made our business possible.

★ We are proud that we have been able to play an important part in helping you "Keep the Show on" under the difficulties of war-time operation.

★ In 1944, we are confident that constantly improving conditions will enable us to serve you even more efficiently than we have in the past. You may rest assured that in all emergencies we will stand by you to the limit of our ability.

★ We look forward, in this new year, to the opportunity of continuing to work together in Peace and prosperity.

W. J. Green

President

National Theatre Supply

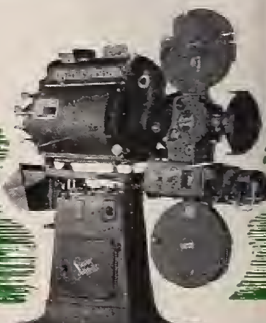
NATIONAL THEATRE SUPPLY DIVISION

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

Simplex

INTERNATIONAL PROJECTOR CORPORATION

90 GOLD STREET, NEW YORK, N.Y.



INTERNATIONAL PROJECTIONIST

FEBRUARY 1944

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INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

AARON NADELL, I.P.'s editor-on-leave now in the Merchant Marine, in an article elsewhere in this issue, reveals the amazing obsolescence of movie theatre projection equipment in French North Africa, about comparable with that used in this country during the infant days of the now lusty industry. It seems incredible that such equipment is taken as a matter of course, and that protection for projectionists against fire hazards is entirely ignored. It seems a wonder, too, even in a war-torn and weary world, that it is possible for theatre owners to secure projectionists to man the ancient equipment usually housed in telephone-size booths. Nadell, however, found recompense when his survey took him to the Isle of Capri, where he found a fairyland that submerged practical thoughts causing him to wonder when the fairy "would lift her wand and wave the whole wonderful illusion to oblivion."

• • •

Next month is Red Cross Month, which means that we all should strain a little more than usual in turning in our voluntary donations for the succeeding year's work on the part of this great organization. And it also means that we must keep in mind that more millions of blood donors will be needed during the year—and right now—to furnish plasma for those who are giving their all in the war effort, and whose lives can be saved if the plasma is made available. Tomorrow will be too late for both contributions, and that "Do It Now" caution is particularly apropos for the Red Cross cause.

• • •

Autos are scarcer and more expensive, and the government is worrying, as no new cars are being produced, about essential transportation needs. It also is worrying about scrap. A million and a half cars made trips to scrap heaps last year, a million in the preceding year. Which means that every day we are getting nearer to the bottom of the pile. Car shortages have caused OPA to set ahead to 60,000 miles the time at which a car can be considered unserviceable and unworthy of repair. This will mean a campaign of protective maintenance that will see fewer cars reach the junk pile than before. Careful maintenance, in itself a laudable wartime conservation practice, in this case at least is cutting into one of scrap's biggest single sources, the thriving auto graveyard.

As scrap returns from automobiles' final resting place grow smaller, it is up to everyone of us to make up the deficit by speeding up collections of industrial scrap now—today—not tomorrow, as we urged in the preceding paragraph. "Scrap is a must—don't let it rust," slogan of the Scrap Drive, is more than a slogan, for maximum collections will shorten the war and actually save lives.

PHOTOGRAPHY'S "SECOND FRONT"

He controls the Jeep with a Tenite steering wheel—strong, tough, and able to stand all climates. Your own car probably has a Tenite steering wheel, instrument panel, accessories.

More than a hundred war products now made of material developed for a better Kodak Film

FILM BASE IS A PLASTIC—one of the earliest. To make a better film, Kodak long ago began producing from cotton linters a "miracle material": cellulose acetate.

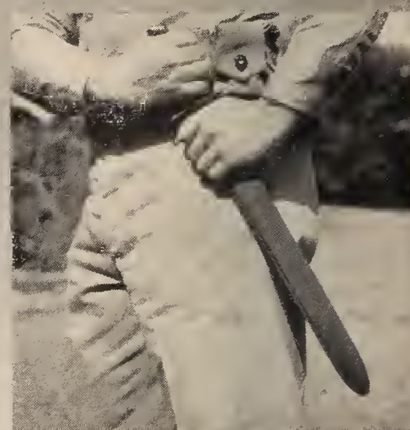
In the form of TENITE—made by Tennessee Eastman Corporation, a Kodak subsidiary—this plastic is tough as a steer's horn and lighter than wood. It can be molded under heat or pressure, or "machined" like lumber or metal. It can be clear transparent, or in an unlimited range of colors.

Tenite is molded into finished products at the fastest rate ever reached with plastics. It led to a minor "industrial revolution" before the war or wartime shortages were dreamed of . . .

Now it has more than a hundred war applications—not as a substitute, but as a superior material. As an extra advantage, it does supplant other "critical" materials.

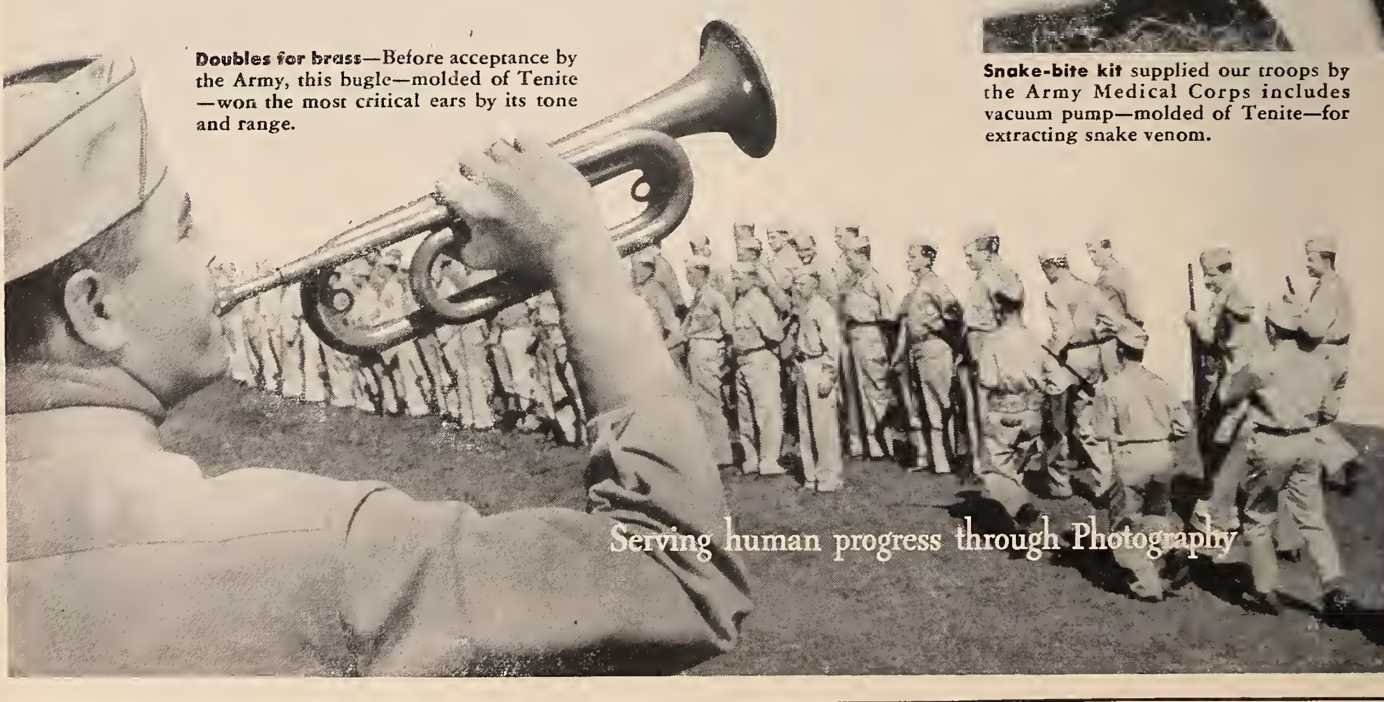
A few war uses are illustrated . . . In a sense, they all started with photography—the ever-growing need for finer film . . . Eastman Kodak Company, Rochester, N. Y.

REMEMBER TORPEDO SQUADRON 8? *. . . how, knowing exactly what the odds against them were, this heroic band of 30 Navy fliers drove unswervingly into the massed fire of the Japanese fleet off Midway? And only one man survived? A stern example to us at home.* **BUY MORE WAR BONDS.**



His bayonet scabbard is Tenite—lighter, tougher, more easily cleaned . . . Cost is little more than half that of scabbards made with earlier materials.

Snake-bite kit supplied our troops by the Army Medical Corps includes vacuum pump—molded of Tenite—for extracting snake venom.



Doubles for brass—Before acceptance by the Army, this bugle—molded of Tenite—won the most critical ears by its tone and range.

INTERNATIONAL PROJECTIONIST

VOLUME XIX FEBRUARY 1944 NUMBER 2

New Sound Emergency Plans Needed—Shortages Balk Old Remedies

By *LEROY CHADBOURNE*

Certain emergency measures formerly used in cases of special urgency are no longer available to the projectionist because of war shortages. Substitutes for them are outlined and discussed in some detail. At the same time the projectionist is cautioned that these substitutes represent extreme remedies, the need for which should be avoided as far as humanly possible by more thorough maintenance and servicing.

IN "LAST ditch" sound emergencies projectionists have always been able to call on certain outside facilities to keep the show running by hook or crook until proper repairs could be made. Two years of war have removed many of those facilities from the scene. They no longer exist.

It is imperative now to re-check all previous ideas of what can be done to restore sound in an extreme emergency. and to make new plans wherever a check-up shows that former resources have vanished.

For example, one of the earliest of all sound emergency measures was to replace a defective power supply circuit, temporarily with a string of *B* batteries. That was done, when required, in the first days of sound; it was always something the projectionist could fall back on, in case of extreme trouble with his plate power supply. Today there are no *B* batteries. Try to buy them.

Another and similar resource was to replace the power supply to certain types of loudspeakers, to the exciter lamps, and to the filaments of certain types of tubes with storage batteries. Storage batteries could also be used to replace a defective filter condenser in low voltage rectifier circuits—they make excellent filters. But it is hardly possible to rent storage batteries today, or to buy them without turning the old batteries in for exchange.

Many sound systems use tubes identical with the types used in home receivers; others use types familiar to radio amateurs, and many rectifiers have common-type battery charging bulbs. With very few exceptions, dating back to the earliest days of sound, any tube used in the projection room could be found somewhere in any community in extreme circumstances when the theatre's own supply of spares ran out.

Tubes Available Today

Home type radio tubes are not only scarce today, but those sold in radio stores fall largely into two types—rejects and rejuvenates. The first are imperfect and available to the public only because they have failed to pass inspection for the armed forces. The second group are simply old tubes that have been washed up and cleaned up, fitted with new labels and new boxes.

Every projectionist knows that a tube which has lost its emitting power may temporarily give a satisfactory meter reading after having lain idle for a while. Within a few minutes, or a half hour or so, the emission again declines to an unsatisfactory level. Some of the old tubes now on sale in radio stores have been subjected to some sort of rejuvenating process. Even with regard to those there remains considerable doubt about their value in a home radio and no doubt whatever as to their undesirability in a theatre. The honest radio dealer, of course, will tell you whether such tubes as he still has in stock are first class, rejects or rejuvenates.

Amateur type tubes can't be bought locally at all, unless some ex-amateur has a few left in his garret; but the chances are he has contributed them to the Signal Corps and gone into the Signal Corps himself. Battery charger bulbs are also extremely scarce. In short, the projectionist can no longer rely on the resources of his local community to supply him with tubes in extreme difficulty.

Pretty much the same applies to the various forms of help that could once be obtained from the local radio man. Radio men themselves are scarce. Many are in uniform and others in branches of civilian war work where their training and knowledge is urgently needed.

It was always possible, at least for ten years before Pearl Harbor, to rent or borrow a public address amplifier locally, and of a type suitable for use as a temporary emergency replacement for a broken-down theatre amplifier. Usually the local radio man had several p.a. systems he was only too glad to rent to anyone, and in towns of any size there were people who made a specialty of p.a. work. They also are hard to find today.

Various minor sound parts, such as resistors and condensers, were always obtainable locally in any quantity and in endless variety. And, of course, one of these "minor" parts can be as essential to the performance as any other item in the system. They are pretty scarce nowadays; so much so that one important Army camp some months ago went into the nearest large city and bought every radio, new and second-hand, that could be found—*simply for their condensers.* Hundred dollar radios were wrecked to get two dollars worth of condensers out of them—that's how urgently they were needed. The condenser situation is somewhat easier at this writing.

Not all projectionists have had actual occasion to make use of really "last ditch" emergency measures. New plans must be made, new resources lined up; and above all, greater efforts than ever must be exerted to avoid any need for emergency measures.

Better Maintenance Needed

Let us consider the last point first. More thorough and more frequent inspection, and closer attention to the first signs of possible trouble are plainly necessary. Closer check on the spare parts inventory is also clearly indicated.

There are two ways to make inspections more thorough. One is to increase the number of items checked. The other is to check any given item more carefully; to take a meter reading instead of relying on mere visual inspection, and so on. For example, if there is suspicion that some part is heating up unduly, doubt on which point is generally decided by sense of touch, don't rely on sense of touch. Get a drugstore thermometer or a cooking thermometer, and place or tie it on that part and leave it there. If the operating temperature shows a steady increase, however slight, there is the strongest ground for suspicion that something is going progressively wrong. Of course, changes in projection room temperature and ventilation and the number of hours the part has been in operation that day, must all be allowed for. With such allowance thermometers intelligently used will catch signals of impending trouble more effectively than any amount of laying on of hands. Similarly, the decibel meter may be used more generously to check suspected increases in background hum, a condition that may or may not indicate a filter condenser is preparing to give way, or a rectifier tube is weakening.

More thorough check-up also implies running down the cause of a possible trouble which may not mean anything in particular, rather than waiting to see what develops. For example, if sound volume appears to be lower than it has been and to require a generally higher setting of the volume control, it may be a good idea under present circumstances to immediately determine the reason for this condition, instead of letting it go until it shows more definite symptoms.

More frequent check-up, which involves weekly inspection of those items that formerly were looked after monthly, and so on, calls for revision of the inspection check lists. If the projectionist never used such reminders, he should certainly make them up now. The present is a very poor time to forget to look at something. Moreover, a check list is not properly used when it is only held in the hand for reference; it should be marked, item by item, as the inspection proceeds. When the inspection is finished the item notations show definitely that every detail has been covered, and that no interruption has resulted in a possible oversight.

The spare parts stock should be inventoried, item by item, without any attempt to rely on memory. The man who says: "I don't have to count the 10-amp. fuses; I know I didn't use any," etc., is just inviting the day when he'll have to groan: "I could have sworn I had 10-amp. fuses left." It doesn't take long to run through the spare parts stock, ticking off the items on a check list. It should be done weekly.

Typical Spare Parts Check List

When the stock is short of any item an order should be placed the same day, so there will be no chance of it being forgotten. A very helpful trick also is to put a dated memorandum in the spare parts cabinet in the place the missing item should occupy. Each week, until the replacement is received, the memorandum will come to hand when the weekly inventory is made; and if shipment is delayed the projectionist will be reminded to follow through with an inquiry, or if necessary, to seek a new supplier.

In all inspections, including inventory checks, the help of a servicing organization is today more valuable than ever. Theatres that have projection room service may find it advisable, under present conditions, to arrange for more frequent inspection visits; those that don't have it should certainly re-consider the desirability of contracting for it.

The service inspector is a technician who specializes in trouble; his trouble experience is naturally greater than that of the projectionist. The organization behind him can generally supply needed parts without excessive delay; they can often lend the theatre an emergency amplifier or power pack, including equipment of special design built for just that purpose. Further, few theatres own a complete outfit of testing equipment, including audio frequency oscillators, decibel meters and the like. In the past, some theatres relied on the fact that much of that kind of test equipment, even if not all of it, could be borrowed or rented in a pinch for some local radio man. The local radio man, as said, is now likely to be in uniform; or else extremely busy and not too strongly inclined to cooperate.

But for all the value of the service inspector and the organization behind him, they cannot do the work of the projectionist or take over his responsibility. He is the man who is in the projection room every minute the theatre operates, and is always there when any sign or hint of trouble shows up. It is up to the projectionist to apply instant remedies. If a breakdown does occur he is responsible for getting the show back on the screen while the service inspector is en route or perhaps tied up helping some other theatre.

It is the projectionist who must, in all those cases, know what to do, have a plan ready for doing it, and have on hand whatever equipment the plan will require.

Most projectionists have had pretty definite ideas of what they would do in any ultra-emergency—as I.P.'s emergencies contest showed. But new ideas are needed now. Some of the contest-winning plans that were considered excellent several months ago have become impracticable in the course of a year.

When everything possible has been done in the way of more careful inspection, prompt repair of small troubles, and arrangements (if any) for special service, the alert projectionist will canvass the situation in his own theatre and his own local community with a view to finding out how far his previous plans for emergencies are still sound and to what extent they must be revised. He will repeat that check-up every few months for the duration. Some remedy open to him now may not be available three months hence; in other cases shortages may possibly be eased.

Amplifier Substitutes

Two possible resources open to most theatres in extreme need are the p.a. amplifier and, less satisfactorily, a large home radio. Both were cited in I.P.'s emergency contest. We will consider the amplifier first. It usually is not suited to sound picture purposes but will have to be adapted to them. It often will not be too adaptable; there are many objections to relying on it. Its sound quality is likely to be inferior. Its power may not meet even minimum academy requirements; there may be difficulty matching it to the impedance of the screen speakers. It probably will not be wired to supply voltage to the photocells, let alone

Theirs is a World without Signposts

When America's early pioneers forged their way westward they were not following an easy path which had been prepared for them. Nor were their thoughts of Today. Theirs was a vision of Tomorrow . . . of something better than that which they were leaving behind.

Just so with America's industrial pioneers. They continually break down barriers . . . do the "impossible". They're a restless lot, not content to copy the ways of others. They insist on blazing trails to new and better things. Their minds are not on the past but on the new horizons of tomorrow.

That's why theatremen turn to Motiograph for the major new developments in projection equipment. It's but natural that they look with great anticipation to the day when they can see and buy Motiograph's brand-new post-war projector. They'll not be disappointed. As pioneers in this field for 47 years, we'll see to that.

MOTIOGRAPH

4431 W. Lake Street "Since 1896" Chicago 24, Illinois

"HASTEN THE RETURN OF PEACE—BUY MORE WAR BONDS NOW"

current to the exciter lamps; it may not even have provisions for changeover. Nonetheless, if the amplifier is a reasonably modern one (built, say, after 1937 or thereabout) it should have enough amplification; its volume will at least enable the audience to hear everything that is said, and its sound quality will be preferable to no sound at all.

Modification will usually involve adding a circuit to supply voltage to the photocells. Many projectionists can lay out this change; others may ask the manufacturer of the amplifier for instructions, or seek the advice of their service inspector. The local radio man can do the job if he is not asked to drop all his other work to help out in an emergency but enlisted in advance and left to do it at his convenience.

Additionally, some provision may or may not have to be made for changeover. In some projection rooms it may be preferable to set up emergency changeover provisions in the exciter lamp circuit.

In many cases it will be possible to match one or another of the amplifier's output taps to the impedance of the theatre's speaker system; in others the speakers may have to be fitted with emergency wiring by which they can be switched over into a different series, or parallel, or series-parallel arrangement, to match them to the output impedance of the amplifier.

If the theatre has both low and high frequency speakers it may sometimes be best to sacrifice quality and wire the emergency p.a. amplifier to the low frequency units only, making sure that the filter network is not included in the emergency circuit: most l.f. speakers in that case will reproduce up to 5,000 cycles or better, although not with very good h.f. distribution. But—depending on the individual projection room arrangements—it may be preferable to use both l.f. and h.f. speakers, working the emergency amplifier directly into the filter network.

In theatres with separate h.f. and l.f. amplifiers, the p.a. unit may have to be so modified that it can be used either as a common voltage amplifier driving both power amplifiers, or as a substitute for the power amplifiers, depending on the nature of the emergency.

These details must be worked out individually to suit each projection room, and the same applies to use of a large radio by theatres that do not have a p.a. system. It may surprise some projectionists that as little as 5 watts power will supply intelligible if not dramatic sound to a large theatre, but such is the case. Many home radios can produce better than 5 watts. Some are only table models or midget models built into a large console, but these are the exceptions. However, the radio will never have enough audio frequency gain, but it has tubes enough to provide such gain, and a power pack capable of supplying its tubes; hence it can be rewired without any important additional parts to serve as a sound amplifier either permanently or whenever it is switched to operate as such.

All the other modifications mentioned in the case of p.a. amplifiers also apply to radios, and will be more troublesome in the case of a radio since the latter will never be equipped to provide changeover without modification; and it will have only one output impedance and, therefore, be more difficult to match to the theatre speakers.

Lastly, as *B* batteries can be used in many theatres (when you can get them) for temporary replacement of a defective power circuit, so either the radio or the p.a. amplifier power circuits can be used (in many theatres) instead of *B* batteries for that purpose.

But however the p.a. amplifier or the radio may be used for emergencies, all arrangements, modifications, connection points and switching details must be fitted up in advance. The whole procedure must be planned in advance, and the projectionist must know exactly and in detail what he is going to do if he ever has to make use of such heroic measures.

Speakers and Exciters

Where there is a d.c. supply for the arc lamp it will almost always be possible to set up some emergency arrangement to provide for low voltage speaker fields and even exciter lamps. A parallel circuit including a suitable dropping resistor is connected to the arc supply line. The values of all dropping resistors needed should be figured, the resistors ordered and kept on hand, and a circuit for their use wired up ready to switch or clip into service. A bank of light bulbs can be used in place of a dropping resistor; but the time to compute such a bank and wire its sockets is not after sound has stopped.

In some theatres the arc supply may be working so near capacity as to be unable to provide the few amperes needed for these other services without sacrifice in arc performance. In such cases the emergency arc supply can be drawn on, if that arrangement is planned in advance. Sometimes a dummy load will have to be connected across it to absorb

(*Continued on page* 24)

Presenting: Arthur W. Lyday

ARTHUR W. LYDAY. Born in Indianapolis, Ind., 46 years ago. He began operating motion picture machines way back in 1913, becoming a member of Indianapolis Local No. 194 in June, 1915 (when some unkind souls claimed he was too young to join), and has been to the forefront in union affairs ever since.

Lyday served as business agent of Local No. 194 during most of 1919 and has been re-elected every year ever since without opposition. It is a full-time, salaried job demanding all of his time and it has been many years since he worked as a projectionist.

His first appointment as a delegate to an I. A. Convention was in 1919, and although he was unable to attend it, he has represented Local 194 at each succeeding convention. Lyday and his partner, the late John O. Benner, were known as the "fighting boys from Indianapolis," and at each I. A. gathering they always could be counted upon to fight for progressive legislation.

Lyday recalls as delegates from the "good old days" Dick Green, Local No. 2; Harry Sherman, Local No. 306; Louis Krouse, Local No. 307; Charlie Shay, Local No. 1; Harland Holdmen, Local No. 160; Ed Tinney, Local No. 70; John Fitzgerald, Local No. 27, and a host of other old-timers too numerous to mention.

"One thought," Lyday cites anent gas rationing, "at the time I first became business agent we were known as walking delegates, and today we are in reality walking delegates."

He was married on June 4, 1918, and has three children—George W., who is with the armed forces in Italy; Arthur H., now stationed in Texas, and Mary Catherine, who is attending Christian College at Columbia, Mo.

In addition to his other duties, Lyday has been secretary of the Eighth District for about ten years. He is an influential figure in the Indiana Republican political party.

The Projection Life of Film†

By *D. R. WHITE and C. DEMOOS*
E. I. DUPONT DE NEMOURS & CO., PARLIN, N. J.

Tests with intermittent sprockets of different diameters have shown that the maximum projections which can be attained depends greatly on a diameter within the range of 0.943 inch to 0.965 inch diameters, about a 2½ per cent range. The sprocket pitch for best wear is greater than the apparent match between static perforation measurements and sprocket dimensions. This is in accord with the view that the elastic characteristics of the base are important at this point in the projection cycle.

Tests with different pressures on the film gate show that this setting is an important factor affecting wear at the intermittent sprocket. The way by which perforations tear is different under the following two conditions: (a) film pitch less than best match for sprocket pitch, and (b) film pitch greater than best match for sprocket pitch.

THE conditions that are required to attain a maximum film life during projection long have been of interest in the motion picture industry, but the subject has rarely been of as great importance as it is today. War conditions have emphasized the importance of all steps leading to conservation of materials.

Under the most favorable conditions set up in the tests, an average projection life of 2,400 projections was reached. Such a large number of projections is not commonly attained under commercial conditions. There are many reasons for this—in the first place, many pictures do not require such a large number of projections from individual prints. Such a life would account for nearly two years of continuous use, if projected three times per day.

It is desirable to cover the theatres with a greater number of prints effecting shorter periods from first to last showing than would be achieved if schedules were worked out on the basis of long, individual print life. In the second place, accidents in handling in projection and rewind rooms tend to produce scratches and breaks which mar the film long before it would deteriorate under laboratory conditions.

The relationship between intermittent sprocket diameter, film pitch and resultant wear was studied. For the purposes of this test, the unwind and rewind magazines were removed from a projector and auxiliary idler rolls introduced to permit the continuous projection of a short loop of film. This arrangement removed all tension from the pull-down sprocket and, of course, changed conditions at the hold-back sprocket since there was now no tension corresponding to the normal pull from the wind-up. The relief of tensions at these points reduced the system to one in which the chief sprocket-hole wear was clearly traceable to the intermittent sprocket.

It was not possible to duplicate completely all the various temperature and humidity conditions which might be encountered in trade practice, but throughout these tests the arc was used with sufficient warm-up time to keep the gate and the machine at a normal operating temperature. The machine was in an air-conditioned room, and thus the entire system was reasonably reproducable.

Previous experience had shown that only a small departure from current commercial standards would be required to produce marked effects on film wear. Accordingly, four sprockets were made:

Sprocket	Root Dia.	Pitch at Median Line of Film
No. 1	0.943	0.1863
No. 2	0.948	0.1873
No. 3	0.956	0.1889
No. 4	0.965	0.1907

With this series of sprockets it was possible to show the effect of relative change in film and sprocket pitch. Results of the first series of tests are shown in Table I.

The greatest number of projections attained, as shown in italics in Table I, shows strikingly that the longest life occurred where sprocket diameters were larger than calculated for a perfect fit, as judged from static measurements of film and sprocket dimensions. It was decided to investigate this observation further.

The projector with which the work was done had been in use for some time in wear studies and conditions of use had been chosen to tear the film to pieces rapidly. No changes were introduced when the test was started, but a re-check showed that the gate tension was heavier than normal and might have caused too great a pull and elongation of the film. Therefore, a second series was run after the gate tension was reduced, with the results shown in Table II.

This table shows a considerable increase in projection life over the previous conditions, but surprisingly, it shows no reduction on the average in sprocket diameter for maximum projections.

Such effects are difficult to explain. In the first series the indication of a maximum is so definite, at a sprocket pitch greater than that of the static film dimensions, that a general drop in the sprocket pitch for maximum life was anticipated with a reduced gate tension. Table II does not show any such drop.

However, the favorable showing on projection life is seen to be definite regardless of an explanation of these details of the data.

A study of the worn perforations of the film showed different, typical tears, depending on the relative pitch of film and sprocket during the test. When the sprocket is small in comparison with the film pitch, the entering tooth rubs the sprocket-hole, tending to break or tear it with a push toward the surface of the film and away from the sprocket itself. Conversely, when the sprocket is large in comparison with the film, the film drags on the tooth as it withdraws from

TABLE I

Film Base	Film Pitch	Projections with Sprocket No. 1	No. 2	No. 3	No. 4
Nitrate—Sample 1......	0.1864	360	*1251*	1070	774
Nitrate—Sample 2......	0.1868	365	585	*1123*	468
Safety—Sample 1.......	0.1865	90	190	*250*	162
Safety—Sample 2.......	0.1863	144	232	*380*	374

† J. Soc. Mot. Pict. Eng., Oct. 1943.

TELEVISION TODAY

V. —The Image Dissector

By *JAMES FRANK, JR.*

THE image dissector is the pick-up device used in the Farnsworth television system and is of the non-storage type. This means that the scanning actually is accomplished while the picture is focused upon the photo-sensitive plate. Since the image dissector alone is not of sufficient sensitivity, it has been combined with the electron multiplier in such a way as to produce a pick-up tube of sufficient sensitivity for practical use in television transmission.

The image dissector (Figure 14) consists of a cylindrical glass envelope, at one end of which is placed a photo-sensitive cathode upon which is focused the picture which is to be transmitted. At the other end of the glass tube is found the main anode which consists of a silver disk. Behind this is a spun silver cup with an aperture in the center, fitted tightly into the tube. This cup forms one of the cathodes of the electron multiplier as well. The second cathode of the multiplier is mounted from a stem in the neck of the glass tube at the far end. An anode plate which serves as the output of the multiplier also is mounted on a stem from the tube side wall between the two cathodes of the multiplier.

A direct current focusing coil surrounds the glass cylinder of the image dissector. Horizontal and vertical deflecting coils are located around the cylinder.

Operating Procedure

The image dissector operates in the following manner: When a picture or scene is focused upon the photo-sensitive cathode, electrons are emitted from the various minute areas of the cathode in direct proportion to the illumination of the image. Ordinarily, these electrons would fly off in any hit or miss direction. The velocity of travel of these electrons likewise would vary tremendously. To overcome these two conditions a direct current focusing coil is wrapped around the glass cylinder. This coil produces a magnetic field which is uniform and of proper intensity. Its lines of force are parallel to the axis of the tube. This magnetic field, therefore, tends to bend the electrons in their travel and forces them to move along lines also parallel to the tube axis.

The main anode at the other end of the tube is energized by a voltage of several hundred volts which both accelerates or speeds up the electrons and also equalizes their speed so that they are all moving at the same speed. This results in electrons traveling in practically parallel lines toward the anode in such a way that if a fluorescent screen were placed in front of the anode the optical image would be reproduced.

The problem then is to convert the electron image so that the desired intelligence can be transmitted over cable or radio to the distant receiver. For this purpose the cup with the aperture is placed behind the anode. The deflecting coils then are energized with currents from a vacuum tube generator in such fashion that the entire electron stream is deflected both horizontally and vertically.[1] The electrons which strike the cup bounce back and are useless but those at the cup aperture pass right through the cup and are useful.

The electron stream for a television picture of present standards is deflected horizontally about 13,000 times per second and vertically 60 times per second. The size of the cup aperture having been determined by the number of scanning lines, only the electrons from a minute area of the photo-sensitive cathode are permitted to pass through the aperture at any one instant. But since the electron stream is deflected, the effect is the same as if the aperture were moved similarly across and down the electron stream.

The electrons passing through the aperture and emerging from the rear of the cup successively represent those emitted by each small area of the photo-sensitive cathode in order starting from the upper left corner of the cathode and moving across and downward.[2] It should be kept in mind that the sensitivity of the device so far is quite small since the electron stream emitted from the aperture consists of the electrons originally emitted from the photo-sensitive cathode.

Practical Application

In order to make practical use of the image dissector it is, therefore, necessary to combine it with an electron multiplier. It may be seen in Figure 14 that this device is located in the far end of the glass tube beyond the anode and cup. An electron multiplier consists of two pure silver cathode plates mounted some distance apart with a cylindrical anode of nickel or molybdenum located between them as shown in the diagram. The d.c. focusing coil also is required for the proper operation of the multiplier.

In this device, electrons are emitted from one cathode plate; in this case by passing them through the cup aperture. The electrons are made to travel to the other cathode in lines parallel to the tube axis by the magnetic field set up by the focusing coil. When each electron strikes the second cathode plate it causes a number of electrons to be emitted which travel back to the first cathode plate. Here the same action is repeated and more electrons are emitted which travel back to the second cathode. Thus the device acts as an amplifier by greatly increasing the number of electrons over those first introduced but always in the same proportion as the original ones. When the electrons are of sufficient quantity (after eleven stages of multiplication) and, therefore, intensity, they are collected by the anode and the resulting electric current sent to an amplifier.

Thus it can be seen that this final current is a fluctuating one which represents the variation in the illumination of the picture image to be transmitted. Trans-

(Continued from preceding page)

the film tending to break or tear it by a pull toward the film surface next to the sprocket. In the case of the best fit no predominant tear could be found; in fact, many perforations had a notch worn in them the width of a sprocket tooth and a few thousandths of an inch deep.

The results of the tests emphasize the fact that small differences of pitch can be important in determining limits of projection life, and they suggest that much greater projection life is possible than is usually achieved under theatre and exchange conditions.

TABLE II

"Normal" Gate Tension

Film Base	Film Pitch	Projections with Sprocket No. 1	No. 2	No. 3	No. 4
Nitrate—Sample 1......	0.1869	1215	1250	*2350*	1935
Nitrate—Sample 2......	0.1867	810	1575	*2439*	2340
Safety—Sample 1.......	0.1869	205	*545*	450	445
Safety—Sample 2.......	0.1866	679	1263	1386	*1390*

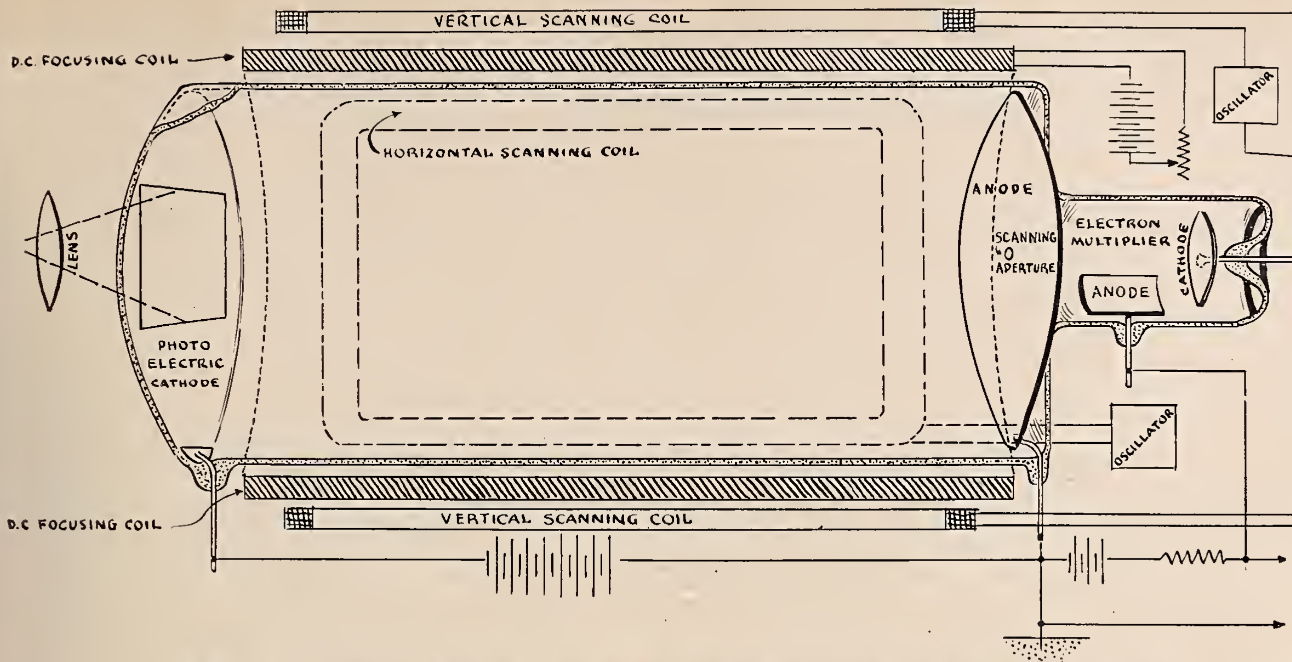


FIGURE 14. *Schematic diagram of an image dissector combined with an electron multiplier*

mission of the image is carried on continuously except for the brief flyback interval of the electron stream caused by the deflecting coils.

Figure 15 is an actual photograph of an image dissector. The photo-sensitive plate can be seen clearly at the near end and the second cathode of the electron multiplier on its stem is just visible at the far end. The position of the coils wrapped around the inside glass cylinder also is evident.

The Farnsworth image dissector is claimed to be especially suited for use in telecine projectors, for televising motion picture films, where average subject brightness is high. One of its advantages is high sensitivity requiring less amplification of the video signal after it leaves the dissector. Excellent resolution or image detail also is a characteristic of the device.

An outstanding advantage that the dissector tube enjoys is that its output signal is entirely free from shading effects and contains complete background information. Both of these advantages are due to the fact that its output is effectively the photo-electric current from the light-sensitive plate. There are no secondary electrons near the plate to rain back and reduce the contrast or otherwise introduce undesirable shading signals.

Since the photo-electric current is the only source of the output current, the d.c. output is directly proportional to the picture background. This information may be utilized in several simple ways to provide the proper background level for transmitter modulation.

The third advantage is the absence of the spurious (non-genuine) signal, known as "retrace surge," which originates during the retrace interval due to the redistribution of the charge on the mosaic of some storage type tubes. The characteristics of these tubes cannot be utilized until the signal is blanked out and the extra amplitude blanking pulse is limited. This spurious signal is not found in the dissector output.

Finally, the image dissector produces no keystone distortion, which otherwise has to be corrected. Keystone distortion is the trapezoidal effect when an image is projected on a flat surface at an angle other than perpendicular (90°). This effect is well-known in theatre projection when a projector is located too far from the center line of the screen. Since the image dissector is focused directly at the scene to be televised, the image of that scene is projected on the photo-sensitive plate properly or the perpendicular.

The image dissector is made in two standard sizes, a long tube for telecine use and a short tube for direct pickup of various scenes. The long tube has a cylinder length of 10⅜" and a diameter of 4½". The short tube has a length of 7⅜" for the same diameter.

1 This results in the electron image traversing the aperture of the cup in a series of 525 interlaced lines repeated thirty times per second.

2 This constitutes the process of image dissection, whence the name of the tube is derived.

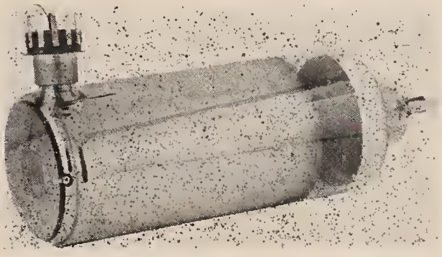


FIGURE 15. *Farnsworth high-fidelity image dissector tube especially designed for telecine operation*

DATES CHANGED FOR MEETINGS OF SMPE IN NEW YORK

The Society of Motion Picture Engineers announces that its 55th semi-annual technical conference at the Hotel Pennsylvania in New York will be held on April 17-19, instead of April 25-27 as previously scheduled.

W. C. Kunzmann, SMPE convention vice president, stated that technical sessions, following the general business session opening the conference on Monday morning, are scheduled to be held throughout the three-day gathering, with special sessions in the evening.

According to W. H. Offenhauser, chairman of the papers committee, papers already submitted indicate the conference will cover new developments in the motion picture engineering field. Others who plan to deliver papers are urged by Mr. Offenhauser to submit them as quickly as possible to permit proper programming.

The tentative program includes a luncheon get-together in the roof garden of the hotel on the opening day, and an informal dinner-dance the following evening in the Georgian Room.

RCA ENGINEERS REVIEW FILM INDUSTRY PROGRESS

Engineers of the Radio Corporation of America have prepared reviews of technical developments in the motion picture industry during 1943, appearing in two important year books. Wallace V. Wolfe, of RCA Victor's Hollywood staff, prepared for the Encyclopedia Brittanica's 1943 year book an article on the industry's technical contributions to the war effort, and also reviewed recent improvements in photography, lighting, optics and other aspects of the film industry.

M. C. Batsel, of RCA's Indianapolis plant, outlined for the American Year Book the progress made in sound motion picture recording and reproducing equipment, in addition to sound amplifying equipment used by the armed forces, business and industry, and various institutions.

A Handy Tube Pre-Heater for Projection Rooms

By *RUSSELL A. SCHREMPP*

MEMBER, L. U. 143, ST. LOUIS, MISSOURI

THE TIME required for slow heater or cathode type tubes to come up to operating temperature is doubly annoying when it becomes necessary to change them during the show. The time and sound loss resulting therefrom may be multiplied by the number of such types contained in a particular amplifier set.

The fact that cathode type tubes retain their temperatures for several seconds after the heater current is withdrawn may be utilized by having a tube preheater in the projection room. The tubes are pulled from the pre-heater and quickly inserted into the amplifier, resulting in immediate operation and minimum loss of sound.

A tube pre-heater is nothing more than a few tube sockets and a voltage reducing transformer. The type of sockets and the heater voltage necessary would, of course, depend on the type of tubes used in the sound equipment. These parts may be found in the junk box of the average radio hobbyist.

The transformer can be any small 110-volt type and need not necessarily be a new or a perfect one. If the primary winding is intact, the secondary may be taken off and a few turns of wire wound in its place to provide the proper filament voltage. The correct voltage may be found by referring to radio tube manuals or to the data sheets usually included with the tubes.

A diagram of the pre-heater used at the Lyric Theatre in St. Louis, where I am employed as a projectionist, is shown below. The tubes in our W. E. 500A set that require pre-heating are W. E. type 310B and 314A; these use filament supplies of 10 and 5 volts respectively, making it necessary to have the tapped secondary winding on the transformer as shown in the diagram.

Advantage of Pre-Heater

A pre-heater is of particular advantage when a tube is suspected of being defective and causing noisy, distorted or weak sound. The replacement tubes are kept in the unit which is switched on immediately the amplifier is believed to be the cause of abnormal operation.

The unit should be located as close to the theatre amplifier as possible. At the Lyric Theatre we can pull the suspected tube from the amplifier with the left hand and handle the pre-heated replacement with the right hand, thereby making the quickest possible change of tubes with a minimum loss of sound.

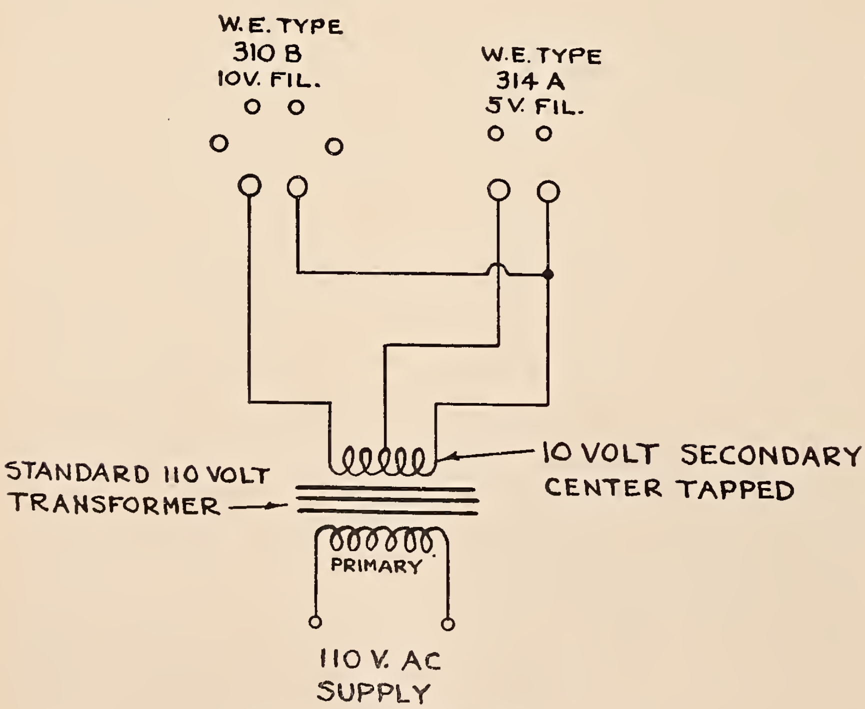


Diagram of tube pre-heater

I. A. Elections

L. U. 110, CHICAGO, ILL.

President, James Gorman; *vice-president*, Frank Galluzzo; *secretary-treasurer*, Ora Beb; *business agent*, E. J. (Gene) Atkinson; *executive board members*, Arthur Tuckman, Samuel Klugman, Charles Funk, Charles McNeill; *board of trustees*, Phil Kore, Edward Schultz and Edward Riley.

L. U. 143, ST. LOUIS, MO.

President, Harvard O'Laughlin; *vice-president*, Leo Canavan; *corresponding and recording secretary*, C. F. Kelsick; *financial secretary*, Earl Rafferty; *treasurer*, A. H. Bode; *business agent*, Harry A. Barco; *sergeant-at-arms*, Emil Werner; *guide*, P. Petsenos; *trustees*, Charles Miehe, C. T. Rice and E. Graves; *executive board members*, Charles Serkes, Joe Schuller, Gerard Polito, Robert E. Miller, R. C. Hawkins and Henry Budde. *Central Trades Delegates*, C. F. Kelsick and Ralph Mulcahy. Kelsick was also elected second vice-president of the Central Trades and Labor Union.

L. U. 186, SPRINGFIELD, MASS.

President, Ed. O'Connor; *vice-president*, Ed. Small; *secretary*, A. J. Payette; *business agent*, Louis Williamson; *executive board members*, Ed. Whittle, Charles Jury and Howard Smith.

L. U. 199, DETROIT, MICH.

President, Frank Kinsora; *vice-president*, Gilbert E. Light; *financial secretary*, Roy R. Ruben; *recording and corresponding secretary*, Jos. A. Sullivan; *treasurer*, James P. Murtagh; *business agent*, Roger M. Kennedy; *seventh member*, Andrew Trainer; *sergeant-at-arms*, Jack M. Smukler; *delegates to I. A. Convention*, Roy R. Ruben, James P. Murtagh, Frank Kinsora and Gilbert E. Light. Edward Ramsey, Ira Rottell and Houston Morton were elected *trustees*, and Frank Kinsora and Jos. A. Sullivan were elected *delegates to the Michigan Federation of Labor*.

L. U. 284, WILMINGTON, DEL.

President, John Kelleher; *vice-president*, Herbert Spring; *secretary*, George Joseph; *treasurer*, Howard Oster; and Frank Pappa, *business agent*.

L. U. 325, WILKES-BARRE, PENNA.

President, Ray Conrad; *vice-president*, Mark Thomas; *secretary*, Teddy Hayden; *financial secretary*, Joe Malloy; *business agent*, Ed. Parsons; *sergeant-at-arms*, Pete Kelm; *executive board members*, W. Fletcher, Joe Moser, Vinc Tate and Bill Kennedy. George Tate, Don Eggleston and Bob Pratt were elected *trustees*.

L. U. 327, CINCINNATI, OHIO

President, Charles Ring; *vice-president*, Walter Partner; *secretary*, Earle Wagner; *treasurer*, Gale Murney; *business agent*, John Krebs; *sergeant-at-arms*, Arthur Wright; *delegates to I. A. Convention*, Charles Ring and John Krebs.

L. U. 378, WICHITA FALLS, TEXAS

President, Herman Voss; *vice-president*,

(*Continued on page 29*)

IN THE SPOTLIGHT

By

HARRY SHERMAN

AS A forerunner of things to come, Local No. 306, New York City, is now organizing classes in which free instruction in the electronic arts will be given to its members. Arrangements have been made with the New York Board of Education for supplementary classes in Advanced Sound Theory and Television. These classes are open to local members who have had previous training in sound theory and practice, and they will be so arranged that they will not conflict with the working hours of the men. Classes for fundamental training, including theory and practical shop work with modern testing equipment, eventually leading to the advanced course, have been considered and those members who are interested have been requested to make their applications to the Educational Committee, which is in charge of the entire program. We take our hat off to Committee Chairman Frank J. Inciardi and his fellow members, Jules Watson, Sam S. Lebow and Jack Pokalsky for their unselfish efforts to help their brother members.

We hail the officers of Local 306 for their foresight in planning for the future welfare of their members. We long have advocated educational organizations within the craft, and in our opinion it is the duty of each union local to appoint a permanent committee whose function it would be to organize classes wherein the members may receive theoretical and practical instruction in all the latest developments of the electronic arts.

● For the first time in its history, Local No. 521, Long Beach, Calif., has contracts with every theatre in its jurisdiction, reports secretary-treasurer Alonzo S. Bennett. No wonder every officer of the local was re-elected by the appreciative membership!

● A fifteen-year-old boy, Albert Behm, lost his life in a fire which broke out in the projection room of the Showshop Theatre in Glendale, Calif., and three other boys were seriously injured. One of the injured boys was running the machine when flames enveloped them, and it was a miracle that all the boys were not burned to death. The fire was confined to the projection room and the equipment was reported damaged to the tune of about $6,000. Behm was buried and eventually will be forgotten by all but his family. The projection room equipment, no doubt insured, will be replaced. The show must go on!!

● Julius Mintz, member of Local No. 182, Boston, Mass., and former chief projectionist at the Bowdoin Theatre, is now a technical sergeant with the Massachusetts State Guard. He has been appointed the projectionist for his outfit, his duties consisting of the showing of Signal Corps training films.

● Congratulations to Phil Rossomondo, member of Local No. 376, Syracuse, N. Y., on his recent marriage. Phil is chief projectionist at the naval training base at Camp Samson, N. Y.

● The National War Labor Board denied the appeal of Local No. 110, Chicago, Ill., for salary increases for its members. In a recent issue we stated that many of the Chicago exhibitors boosted their admission prices, *without* the sanction of any government agency. Incidentally, we wonder if this same labor board will take any action on the $1,000 weekly salary raise recently voted to Harry Cohn, president of Columbia Pictures. Mr. Cohn's salary is now $3,500 per week, plus a $300 weekly expense account.

● A banquet was recently tendered Stephen Hart, president of Local No. 425, Kankakee, Ill., in honor of his twenty-fifth consecutive year as an officer of the local. The membership presented Hart with a solid gold ring and a picture record of his achievements during his twenty-five years of office.

Hart has a long and distinguished record as a labor organizer. In addition to his duties as an official of Local 425, he has served as a delegate to the Kankakee Federation of Labor for the past twenty-five years; he has been a delegate to the Illinois State Conference for ten years, and has represented his local at five I. A. Conventions.

In addition to the entire membership who attended the banquet in honor of their president, many city notables, including the mayor, were present. Out-of-town guests included business agent Fred Shoup and Frank Wanto of Local No. 193, Bloomington, Ill., and Paul A. Wills, president of Local No. 482, Champaign, Ill.

● Solly Pernick, Local No. 1, and Morrie Seamon, Local No. 751, New York City, were members of a committee representing the American Theatre Wing which received a check for ONE MILLION DOLLARS in royalties from the picture, "Stage Door Canteen."

● H. Maitre, chairman of the sick committee for Local No. 293, New Orleans, La., reports that the local has lost four of its oldest members within the past few months with the passing of Paul Montamant, C. S. Marks, Fred Cady, and Henry Soroe.

● The welcome home mat was thrown out for Tech. Sgt. Norman Goldstein, former chief projectionist of the Adams Theatre, Los Angeles, Calif., and a member of Local No. 150, who was home on furlough from his duties in the southwest Pacific.

● Vincent Jacobi, business agent of Local No. 1, New York City, has been re-elected president of the Combined Amusement Crafts, an organization representing twenty-seven AFL locals whose jurisdictions cover all phases of the industry in Greater New York.

● We were very much saddened to learn of the death of Lt. Leslie Carlyle Blakeslee, Jr., of Local No. 277, Bridgeport, Conn. He was a member of the 18th Marines (Engineers), Second Marine Division, F. MF., and was reported killed in action November 21, 1943, in the battle of Tarawa.

Lt. Blakeslee was a graduate of the

Lt. Leslie C. Blakeslee, Jr.

Connecticut College of Pharmacy and prior to his enlistment with the armed forces he worked as a projectionist at the Park City Theatre in Bridgeport. He joined the marines July, 1942, and received his basic training at Parris Island, S. C., and from there he was sent to O. C. S. at Quantico, Va., where he received his commission. He graduated from the Naval Academy in Washington, D. C., as a Bomb Disposal Officer.

To his father, who has been a charter member of Local 277 for the past thirty-one years, and to his many friends, particularly Peter Bernard, business agent of 277, who was young Blakeslee's godfather, we extend our deepest sympathy.

● The 25-30 Club of New York City combined its installation of officers and testimonial to President Mike Berkowitz in a shindig which took place in the club rooms of the Grand Street Boys. Judging from the attendance of many leading figures in the industry and the late hour the party finally broke up, we would say it was a huge success.

Acting for the 25-30 Club membership, P. A. McGuire (N-S-B) presented President Berkowitz with a handsome set of cut glass decanters fitted in a chromium stand. P. A. was flabbergasted when he, in turn, was presented with a traveling bag in appreciation of his untiring efforts in behalf of the club.

Herman Gelber, president of Local No. 306, installed the officers, all of whom with the exception of Bob Sanders, the new trustee, were re-elected from the previous year. The Club officers for 1944 are Mike Berkowitz, *president*; Morris Rotker, *vice-president;* Morris Klapholz, *secretary;* Henry Weinberger, *treasurer*, and Mike Polito, *sergeant-at-arms.* Joe Abrams, Joe Fitterman and Bob Sanders were elected *trustees.*

Dave Narcey and Abe Kessler were in charge of arrangements and yours truly acted as toastmaster.

National-Simplex-Bludworth was represented at the party by Herbert Griffin, Arthur Meyer, P. A. McGuire, and Rudy Kneuer. Despite a fractured back, Bill Kunzman of National Carbon put in an appearance. Altec district managers Bert Sanford and Lane Patton were present with a crew of their sound engineers, namely, R. W. Kautzky, A. J. Rademacher. G. M. Pinckney, Tom Prendergast, H. Fetig, John North, Lt. Jerry Littenberg and Lt. Harold M. Steele. We had the honor of presenting our very good friend, Frank Tichenor, publisher of several very successful aeronautical magazines, who was a member of our industry many years ago.

Among the many guests in attendance were Harry Storin and Morris Kravitz, vice-president and business agent, respectively, of Local No. 306; Harry Rubin, projection supervisor for Paramount Theatres; Ben Stern, president of the Projectionists' Square Club; Bob Goldblatt, now an exhibitor but the man responsible for Local 306 charter; Charles Muller, chief projectionist of Radio City Music Hall; Charles Kellner and Nat Ripp of RCA, and many others too numerous to mention herein.

● We notice that J. Max Ealy has been re-elected business agent of Local No. 378, Wichita Falls, Texas, for the 20th consecutive year. Max cuts quite a figure at the I. A. Conventions with his unusual color schemes. Those highly-colored suits and rainbow ties certainly do make him look collegiate; when Max comes down the street it looks as though a football formation were coming your way. Just plump, eh, Max?

● Julius Dannenberg, former trustee for Local No. 1, New York City, received a very interesting letter from his son now serving with the armed forces in Italy, which bears out our oft-repeated contention that the newly made army projectionists don't know what it is all about. Writes young Dannenberg:

"They were supposed to show 'Arsenic and Old Lace' here at headquarters. Well, the film failed to arrive, so in its place they showed 'Hit Parade.' At the end of the first reel, the projector broke down, so I left and went back to the barracks to find a movie going on over there. It was an oldie that I had seen several years ago, 'Waterloo Bridge,' with Robert Taylor and Vivien Leigh. Having nothing better to do, I watched it until the end of the second reel when this projector broke down completely. In disgust, I went to bed where I should have gone in the first place."

This may and may not be typical of the projection work they get in the armed service, but we will bet our last bottom dollar that neither of the aforementioned machines were run by men who were experienced projectionists in civilian life. We will get many of these so-called projectionists when the war is over, and they will try to compete with our men. It would be to the interest of the craft and unionism to put these newcomers in our field through a stiff examination before admitting them to union membership.

● Although his two sons, Marvin and Herbert, are in the service, Joe Klynn, member of Local No. 160, Cleveland, Ohio, is a steady purchaser of war bonds. Good work, Joe, wish there were many more like you.

● With the steadily increasing use of motion pictures in the training of our fighting men in the armed forces, we can look forward to the day when motion pictures will play a vital role in the education of our children. Although the showing of motion pictures in schools and colleges as a supplement to classroom studies is not uncommon today, we do not think it far-fetched to say that in the classrooms of tomorrow motion pictures will be considered an integral part of the teaching system.

(Continued on page 25)

Newly elected officers of L. U. 143, St. Louis, Mo. (Left) Harry A. Barco, business agent, and (right) Harvard O'Laughlin, president

Motion Picture Projection in French North Africa

By *AARON NADELL*

MOTION PICTURE entertainment in North Africa is provided by U. S. service installations and French civilian theatres. Both show American films. Those played in the civilian theatres carry explanatory French captions, added in Hollywood, which enable a foreign audience to follow the story. The civilian theatres also show French language films. Patronage is very heavy. The local theatres, in which all seats are reserved, usually are sold out hours before the show starts. Service theatre seats are not reserved, and late comers seldom find one.

The French projection equipment is pitiful. The projectionists work under almost inconceivable handicaps. American service installations, maintained by the Army, the Navy and the Red Cross, are as well equipped as could be expected under the circumstances, but also operate under great difficulties in view of the shortage of spare parts of any kind, even of wire.

Service films are inexplicably scarce. It was learned at the American exchange in Oran that there were only 65 pictures for the entire Mediterranean Base Section, which could easily use three times as many. The exchange has had to refuse calls from hospitals, because all films were out. This is hard to understand, with so many ships coming to this part of the world from back home. Dozens of full-length features could be carried easily in the miscellaneous space available on a single freighter.

A French "Booth"

The term projection room is too dignified for the enclosures visited in French civilian theatres. In what appeared to be the de luxe house of a city of 250,000 inhabitants the following equipment was found:

Ernemann projectors, very old, unenclosed like our own Powers projectors of long ago. This model had sprockets of large diameter—about 1¼". The lens assembly pivoted upward and out of the way to allow threading.

Strong a.c. lamps, burning 70 amperes at 25 volts, with modern copper-coated American carbons.

Zeiss Ikon pedestals.

Western Electric sound system, comprising 206A reproducer units with 49-type PEC amplifiers, 713A control cabinet, and 41 and 42 type amplifiers. There was also a speaker field supply copper oxide rectifier and filter panel which was labeled "Made in France" and looked it, for the underwriters would throw it out of any projection room at home. It was completely unenclosed, resembling a piece of American equipment that had been taken out of its cabinet and mounted on a wall, every wire and part exposed.

A French power switchboard and fuse panel, looking like an antique of the gay nineties, the board being white marble, the fittings unenclosed brass knife switches and unenclosed jumpers of fuse wire.

This equipment was installed in a projection room with wooden walls and wooden floor. Around these wooden walls power and light wiring was run without benefit of cable—just plain, cotton-coated number 12 or thereabouts on porcelain cleats.

The rewinder was hand-driven; open type, of course. There was no patching device; only a little bottle of film cement and an old razor blade; patches were made by hand. There was no film cabinet.

Only one exit had been provided. It was triple-locked and kept locked during the show. Three separate locks would have to be opened to let the projectionist out of that wooden trap in case of fire.

The place was without sand bucket and without fire extinguisher. Carbon butts were dropped into a bucket of water, and that same bucketful of water would be the only resource against fire.

Remember that the above, describing the projection room of a first-run house in a city of a quarter of a million people, represents only its normal condition and omits reference to the additional handicaps imposed by the war. Some of these will be mentioned later.

Yet the very courteous French manager was extremely pleased with his projection room. He was lavish in praise of the Western Electric sound system, which had never given him any trouble, he declared, since its installation in the early 1930s. It is serviced regularly by a Western Electric engineer — a local Frenchman.

Wartime conditions, however, were giving that engineer considerable trouble, and they were placing a tremendous burden on the competent and underpaid projectionist. The W. E. 42 amplifier, as most readers well know, uses four identical W. E. triodes, two functioning as rectifiers and two as amplifiers. To conserve the remaining pre-war tubes for use as amplifiers the service engineer had changed the rectifier arrangement and substituted a full-wave RCA 80 tube for the two W. E. 205s.

Some Projection Problems

The projectionist faced some tougher problems. When visited, he was in the act of completely rewinding one of his arc supply power transformers. It had burned out; he had installed his only spare, and then stripped the damaged unit right down to its iron laminations and was rewinding it with new wire. Language difficulties made it impossible for him to explain (though he tried) how and where he had managed to get even wire in a city stripped of all spare metal down to the last razor blade and watch spring. He is almost without tools; should he break or damage one of the few remaining he has practically no way of replacing it. And still he keeps his show running.

For these services, and for working in a fire trap, he receives the wage of $14.00 a week (700 French francs) in a city where food and clothing cost much more than in the United States. Food is very scarce although this country is poten-

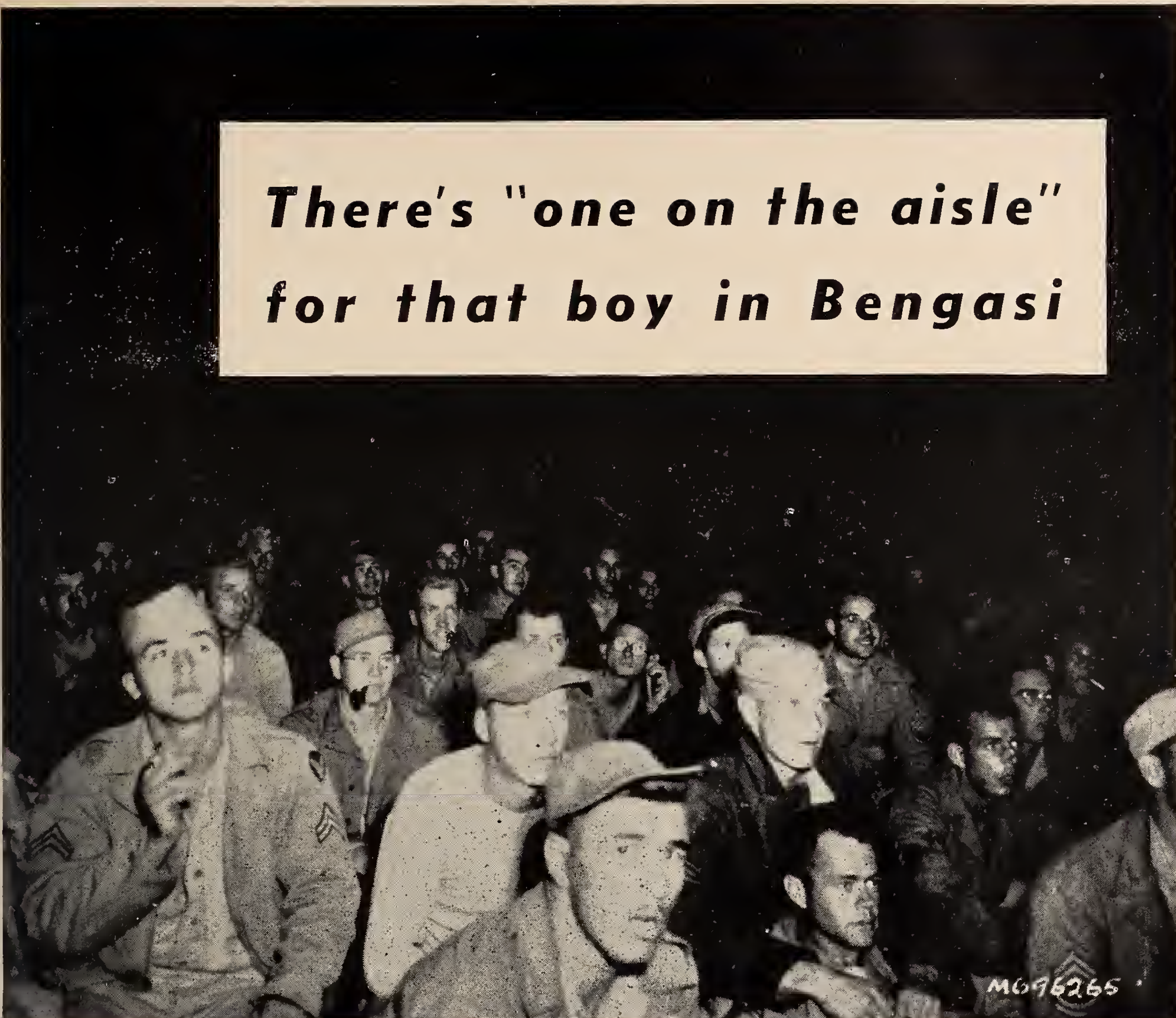


Photo by Army Overseas Motion Picture Service.

because you shared the new projection equipment with those who need and appreciate entertainment so much.

Help bring those fellows back to your box office sooner by buying more War Bonds NOW.

The Strong Electric Corporation

87 City Park Avenue **Toledo 2, Ohio**

THE WORLD'S LARGEST MANUFACTURERS OF PROJECTION ARC LAMPS

tially as rich as California, which it greatly resembles, but the farms were stripped to provision Germany and what little is left sells at ridiculously high prices.

Clothing can't be bought, except for the few necessities recently sent over on lend-lease, and there is practically no other merchandise. The great stores are closed—nothing to sell. They were looted by Vichy in the modern scientific manner; everything in them bought up with worthless paper money printed especially for that purpose.

To forget their troubles, people go to the movies. And the $14-a-week projectionist keeps the show running. He gives them three shows a day, seven days a week, and he doesn't do a bad job in spite of all his handicaps. His screen and sound results compare satisfactorily with those of a third-rate American theatre.

The movies draw everyone, even the Arabs—even the veiled ladies, shapelessly robed in white from crown to toe. They must not disclose more of themselves than one eye—a little black dot peeping through a triangular opening that often is not large enough to reveal the white of the eye. What they make of the typical Hollywood output only Allah knows, but they crowd to the movies.

Another civilian theatre visited, again a large downtown house, was not very different from the one described above. Open wiring, unenclosed wire fusing, and a general "Spirit of 1898" pervaded that first-class projection room also; and its screen and sound results were similar—about equal to those of a third-rate house back home. Sound equipment was unmistakably W. E. but the 46 amplifier bore the name plate of an English maker, apparently a subsidiary. The 708A motor control cabinets—the old "mystery boxes"—carried the standard American name plates. Projectors were Ernemann, lamps Strong.

Suburban Projection

But what about the third-rate French African theatre? One visited, of less than 400 seats, had a "booth" that seemed scarcely large enough for one projector, although two had been crowded in. They were of foreign manufacture, but their make could not be ascertained; there was no manufacturer's name anywhere. They looked somewhat like the open Ernemanns previously referred to, but if they were genuine they must have been of an even earlier model, and the absence of a maker's name in the casting of the main frame suggests that possibly they were bootleg imitations. The magazines and pedestals were Zeiss Ikon.

The soundhead, likewise nondescript, presented a remarkable arrangement. It was not interposed between the projector and the lower magazine but mounted to the rear of the lower part of the projector, about where the bottom of a rear shutter would come if there had been a rear shutter. The film, on leaving the intermittent sprocket, looped backward through the soundhead and then forward again to the lower sprocket of the projector, and thence directly into the lower magazine. There was no sprocket on the soundhead, but it had a revolving drum that looked like, and appeared to act like, a rotary stabilizer.

This whole soundhead arrangement constituted a single unit that bolted to the projector main frame. The film ran diagonally downward past the exciting light; the light beam was maintained at right angles to the sound track by the fact that the lens tube pointed upward at an angle of about 45°. This feature was necessary to secure compactness in the space available between the bottom of the projector and the lower front edge of the lamphouse.

The lamps were extremely old vertical arcs. They might have been ancient American lamps, but there was no maker's name.

The sound amplifier was French. It had French tubes, with their peculiar bases. They resemble an American radio-type tube with bakelite base but no prongs projecting below it. Instead, protruding horizontally around the bottom of the base, are short flat studs of brass. The socket consists essentially of a number of horizontal brass clips—like the jaws of very small knife switches—pointing inward from a circle of insulating material. The tube is set inside the circle—and a twisting motion then engages the flat studs of the tube base between the jaws of the brass clips.

However, a standard American socket and an RCA6J7 tube were used in the single stage PEC amplifier (entirely distinct from the main amplifier) that was mounted on the projection room front wall.

The main amplifier was set on a wooden bench along a side wall. Another bench supported a hand rewinder and a bottle of film cement. A tiny radio speaker, without baffle, dangled from the ceiling. A single, unshaded lamp bulb—about 20 watt size—also hung from the ceiling; this was the only illumination. A very small, white-marble-panel-and-brass-toggle-switch power board was mounted above the trap door entrance; it carried no fuses.

There was hardly room for the projectionist to turn around. Walls and floor were wood; so was the shaky homemade ladder that led up the trap door. Electric wiring was of the exposed type. There was no film cabinet, and no receptacle for depositing carbon butts could be seen. Perhaps the projectionist drags a pail of water up the ladder with him.

This picture palace had a screen about 12 feet wide, and perhaps 400 seats distributed between orchestra and balcony. Unfortunately it was not possible to wait for the opening of the performance, or to return again to that suburban region, and the quality of the show must be left to the imagination.

U. S. Service Projection

The Navy and the Red Cross use both 36- and 16-mm. equipment; the Army prefers 16-mm. but nonetheless shows the latest pictures, reduced to that size specifically for Army use. Every well known make of American 36- and 16-mm. apparatus appears to be represented in the equipment of the different services. Quality varies somewhat accordingly, and also according to the conditions of operation.

Carbons are brought from the States in sufficient quantities to provide a surplus for the French civilian theatres. There is a shortage of film, which is particularly acute in the 16-mm. classification. Replacement parts are scarce and orders for them are filled slowly. Projection equipment is sometimes out of use for extended periods because needed replacement parts have not arrived. Central repair shops are maintained by the Army in the larger North African cities.

The audiences are not critical about screen or sound quality. Americans here have little hope of seeing home again for quite some time to come. They are homesick—within normal limits, as anyone would be; and only in the movies can they find the familiar sights and sounds of home. They crowd the shows—*SRO* is the rule. The portable 16-mm. equipment is used in any convenient building, even in open sheds with only a roof and no walls. Screens are small, and screen lighting is less than brilliant in the aforementioned sheds: the portable speakers are put down casually somewhere or other near the screen and after that may accidentally be further displaced. These details don't matter.

On the Isle of Capri

Circumstances may or may not permit the check-ups necessary for a future report on projection in Italy. At present only a footnote can be added, about an Italian island that can't be an actual island.

As you go about the Isle of Capri you know very well the place doesn't exist—that you only think it does; a place like that can't exist. You wonder idly when the Blue Fairy will lift her wand and wave the whole wonderful illusion to

(*Continued on page* 26)

Motion Picture Film Regulations of the Underwriters Code

HEREWITH are reprinted (with a few deletions of matter of no interest to I.P. readers) the regulations of the National Board of Fire Underwriters anent the handling and storage of nitrocellulose motion picture film. Attention is particularly directed to *paragraph* 2-*b* which sets forth that regulations apparently applying only to studios, film exchanges, etc., may also apply to theatre projection rooms wherever processes or conditions are similar.

1. *Application of Rules.*—These regulations are intended to apply to the storage and handling of nitrocellulose motion picture film, in all places except establishments manufacturing such film and storage incident thereto. They are not intended to apply to the storage and handling of film having a cellulose acetate or other approved slow-burning base nor to photographic and X-ray film.

2. *Scope of Regulations.*—(a) These regulations are intended to provide reasonable provisions for the storage and handling of motion picture film, based on minimum requirements for safety to life and property from fire.

(b) It is strongly recommended that film exchanges, laboratories and studios be permitted only in sprinklered buildings of fireproof[1] construction. In buildings of non-fireproof construction which have been adapted to such occupancies, automatic sprinklers should be installed as hereinafter specified and suitable fire cut-offs provided between each room in which film is handled or stored and other sections of the building, and adequate exit facilities provided. Suitable requirements will be found in the Recommended Building Code of the National Board of Fire Underwriters.

3. *Arrangement of Regulations.*—(a) These regulations are divided into two parts: Part I gives general provisions regarding the storage and handling of film; Part II gives special provisions for special occupancies as motion picture theatres, exchanges, laboratories, and studios, which apply in addition to any and all of the general provisions which may also be applicable.

(b) The grouping of the special provisions under the heading of special occupancies is merely for convenience in the application of these regulations. Any particular process or operation in any type of occupancy shall be governed by the provisions given for that process or operation, whether under the heading of that occupancy or any other heading, unless otherwise specifically provided herein. For example, any process in a studio which, from the standpoint of the authority enforcing these regulations, partakes of the same nature as some process covered under laboratories, shall be governed by the provisions for that process given under laboratories.

4. *Approval of Plans.*—Before constructing any building for use as motion picture film occupancy, or remodeling any building for such occupancy, or building any film vault, or installing any enclosure for motion picture projection, or installing any screening room, complete plans of such proposed construction or installation should be submitted to the inspection department having jurisdiction for approval. These plans shall show in detail all proposed construction and structural changes and the means of protection to be provided, the heating system with the protection for it, the electrical equipment, and the character and location of exposures.

5. *Definitions.*—Whenever used in these regulations the following words shall be construed as having the meanings given below.

(a) "Film," or "motion picture film," motion picture or sound recording film having a nitrocellulose base, whether in the form of unexposed film, positives, negatives, scrap, or used film.

(b) "Vault," a vault constructed and equipped in accordance with the requirements of Section 17.

(c) "Cabinet," a cabinet constructed and equipped in accordance with the requirements of Section 16.

(d) "Standard roll," a roll of film $1\frac{3}{8}$ inches (35-mm.) wide and 1,000 feet long, weighing approximately 5 pounds, used as a unit in calculating the weight of film.

(NOTE: This definition is intended to establish a measure of length and weight and is not designed to prohibit the use of double rolls—2,000 feet—of film in theatres and exchanges.)

(e) "Partition," except where some other form of construction is specified, a partition constructed in accordance with the specifications given in sub-section 112.

Handling of Film

181. *Film Shall be in Containers.*—All film shall be kept in closed containers except during the actual time it is being worked upon or examined. This is very essential from the standpoint of fire hazard and safety to life. I.C.C. shipping containers and individual containers for each roll of film with proper corrugations on each side are recommended.

182. Film shall not be placed or kept under benches, tables, or other surfaces which would shield it from the discharge of sprinklers.

183. *Scrap Film.*—Scrap film shall be kept separate from waste paper and other rubbish, and shall be kept under water at all times. It shall be collected from work rooms at least once daily, and removed to a room used for no other purpose, where it shall be kept under water in steel drums with tight covers. These drums shall be disposed of at frequent intervals. Discarded film in full or part rolls shall be kept in vaults. Scrap film shall not be baled or burned.

(NOTE: Motion picture film in the form of clippings and short lengths is in a very hazardous form. Safe precautions in the handling of such scraps are most essential. Baling and burning of film are processes offering a distinct fire hazard. Sending film to a central reclaiming plant in lieu of burning is recommended.)

184. *Transportation.*—(a) Motion picture film should never be transported in any vehicle or other public conveyance used for the transportation of passengers, unless enclosed in I.C.C. shipping containers.

(b) Motion picture film should never be allowed in any underground subway train or station unless under the jurisdiction of the Interstate Commerce Commission and conforming to the regulations thereof.

Projector Requirements

191. *Enclosures for Motion Picture Projectors.*—(a) Motion picture projectors using nitrocellulose film shall be operated or set up for operation only within an approved enclosure, not less than 48 square feet in size and 7 feet high. If more than one machine is to be operated an additional 24 square feet shall be provided for each additional machine.

For new construction, a size not less than 8 feet wide, 10 feet deep and 8 feet high is recommended for one projection machine, and not less than 14 feet wide, 10 feet deep and 8 feet high for two machines.

(b) The walls and ceiling of the enclosure shall be built of brick, tile, or plaster blocks, plastered on both sides, or of concrete, or of a rigid metal frame, properly braced, and sheathed and roofed with sheet iron of not less than No. 20 U. S. gauge metal, or with $\frac{1}{4}$ inch hard asbestos board, securely riveted or bolted to the frame, or 2 inches of solid metal lath and cement or gypsum plaster. All joints shall be sufficiently tight to prevent the discharge of smoke. Non-combustible acoustical material may be used on ceiling and walls, on top of the plaster.

(c) The entrance door into the enclosure shall be at least 2 feet by 5 feet, of construction equivalent to the sheathing

permitted above, for rigid frame construction. and shall be kept closed at all times when not used for egress or ingress.

(d) Two openings of each motion picture projector shall be provided; one for the projectionist's view (observation port) shall be not larger than 200 square inches, and the other through which the picture is projected (projection port) shall be not larger than 120 square inches. Where separate stereopticon, spot or flood light machines are installed in the same enclosure with picture machines, not more than one opening for each such machine shall be provided for both the projectionist's view and for the projection of the light. but two or more machines may be operated through the same opening; such openings shall be as small as practicable and shall be capable of being protected by approved automatic shutters.

(e) Each opening shall be provided with an approved gravity shutter set into guides not less than one inch at sides and bottom, and overlapping the top of the opening by not less than one inch when closed. Shutters shall be of not less than 10-gauge iron or its equivalent, or of ¼ inch hard asbestos board. Guides shall be of not less than 10-gauge iron or its equivalent. Shutters shall be suspended, arranged and interconnected so that all openings will close upon the operating of some suitable fusible or mechanical releasing device, designed to operate automatically in case of fire or other contingency requiring the immediate and complete isolation of the contents of the enclosure from other portions of the building.

Each shutter shall have a fusible link above it, and there shall also be one located over each upper projector magazine which, upon operating, will close all the shutters. There shall also be provided suitable means for manually closing all shutters simultaneously from any projector head and from a point within the projection room near each exit door. Shutters on openings not in use shall be kept closed.

(f) All shelves, furniture and fixtures within the enclosure shall be constructed of incombustible material. Tables shall conform to paragraph 117. No combustible material of any sort whatever shall be permitted or allowed to be within such enclosure, except the films used in the operation of the machine, and film cement.

(g) Ventilation shall be provided by one or more mechanical exhaust systems which shall draw air from each arc lamp housing and from one or more points near the ceiling. Systems shall exhaust to outdoors either directly or through a

(*Continued on page* 27)

Gauge for Projector Adjustment

By *H. Y. BALLOU*

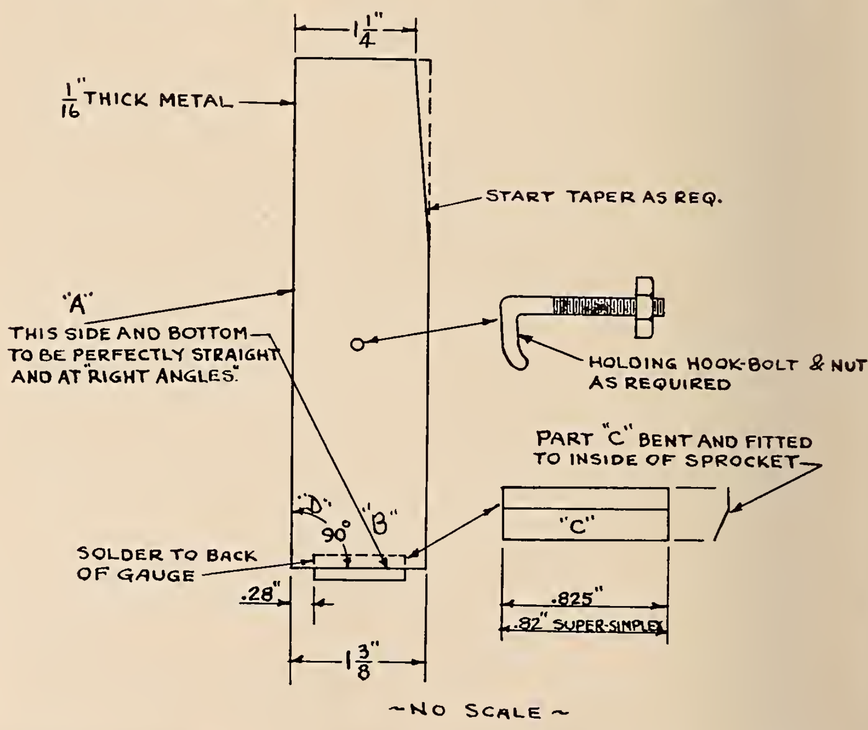
MEMBER, L. U. 150, LOS ANGELES, CALIF.

MANY projectionists overlook one very important projector adjustment. I refer to the alignment of the film guide roller and the intermittent sprocket. This alignment cannot be made without the aid of a gauge constructed for this specific purpose.

This gauge may be constructed with the tools found in the average projectionist's tool box, and the material for it usually can be found in most projection room junk boxes. Any metal about 1/16 inch thick, and flat, will answer the purpose. Referring to the diagram below, side "A" and bottom "B" must be perfectly straight. Angle "D" must be exactly 90 degrees; "C", which is made to fit the inside of the sprocket, is soldered to the back of the gauge. In the case of a Super-Simp, it is .82″ wide. The purpose of "C" is to hold the gauge in place so that side "A" will be exactly in line with the outside edge of the sprocket. The holding hook, which is hooked into the aperture hole after the aperture plate is removed, holds the gauge firmly in place.

The gauge is used in the following manner: Remove the aperture plate, remove the gate, back out screw in guide roller collar, making sure to take up the end play in the guide roller shaft. Now place the gauge against the film tracks; place hook through the aperture hole; seat bottom of the gauge on sprocket teeth; tighten nut on hook slightly, and with finger rock gauge sideways to make sure it is seated on sprocket teeth. Hold it there and tighten up on nut. Now set the roller against the gauge and tighten the collar screw. Turn roller with finger; it should touch the gauge lightly all the way around.

Some of these measurements are in hundredths, but with the aid of a machinist's scale in hundredths and a small magnifying glass, it is not difficult to work light metal to hundredths.



ROOSEVELT DESIGNATES MARCH AS RED CROSS MONTH

Next month has been designated by President Roosevelt as Red Cross Month, and during the period the American Red Cross will conduct its 1944 War Fund drive. This year's campaign will call for unprecedented efforts as the work of the organization is increasing manyfold as the war progresses.

As all activities of the Red Cross are financed by voluntary contributions and gifts it is essential that every citizen must do his or her part in order that the organization may fulfill its many obligations to the armed forces and to our people. During 1944 it must supply some 5,000,000 blood donations. Each month 2,500 nurses must be recruited for the Army and Navy. Red Cross field directors and other trained personnel must be stationed at military and naval posts and hospitals to help our fighting men and their families when personal trouble brews, a task in which the Red Cross chapter on the home front ably does its share. Many other activities demand that the goal be met.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

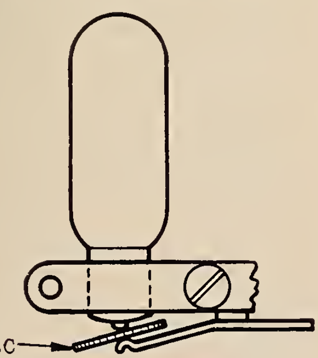
Focusing Exciter Lamp During Show

Recently I was called upon to focus an exciter lamp in one machine, while the other was in operation. The exciter supply was an MI-1500 unit for both lamp and field supply. To do the job quickly the relay contacts were strapped by a short jumper having clips at each end. This permitted both lamps to burn at one time and as soon as the focusing was complete the jumper was removed. There was no change in volume during the time both lamps were burning.

The same procedure could be used for the a.c. lamp by strapping the change-over switch. Care must be used in this case, however, as the supply voltage would be 110 volts, a.c.—Dan Ferguson, *RCA.*

Conserving Exciter Lamp Sockets

As a conservation measure to prolong the life of # 21423 exciter lamp socket contacts and to provide a better contact, very good results may be obtained by the following procedure: Obtain a brass or copper disc or coin and place it between the exciter lamp contact and the exciter lamp contact spring, as shown in the



accompanying sketch. This metal disc will provide a good contact and act as a heat radiator.—Frank Hambe, *RCA.*

Using 6L6 Adapters with Simplex-Acme-TA-62 Amplifiers

Simplex-Acme-TA-62 Amplifier was designed for the use of 6L6 metal tubes. Sockets being placed close together it is almost impossible to use 6L6G glass tubes. By making two octal to octal adaptors from an old tube base and socket and placing them in second and fourth sockets of the amplifier, it will raise these two tubes so that the bulge of the glass tubes will not be side by side but one above the other.—H. W. Hepler, *RCA.*

Repairing Volume Controls

Often a temporary relief from the "scratching" or "dying out" of sound in the projection room can be cured by inserting a one-turn piece of thin wire (from a shipping tag, etc.) underneath the present wire shaft retainer, *i.e.*, between this retainer and the shaft bushing. The most effective way is to remove the volume control, and the wiping arm shaft and clean both the shaft and its bushing. Before replacing the wiping arm, "pin prick" it once or twice where it rides on the resistance wire and the result is a greately improved wiping and better contact.—Fred Huff, *RCA.*

Conservation of Relays

Relays used in power units and similar type of equipment become defective where contact springs are riveted. Placing a small jumper here will carry current when the rivets loosen and will prevent complete failure of this part.—Wm. Armstrong, *RCA.*

Another Use for Mazda Reflector Spot Bulbs

A novel arrangement recently run across in a projection rewind room was the use put to a 105-watt reflector spot bulb. It was mounted in a socket about five feet above the rewind bench and focused to the space between the two rewind elements where the film splicer usually is placed. This lamp served two purposes, namely, (1) it was a very great aid in examining film and (2) it served as a method for applying heat to the film splicer, which definitely helps in making a good splice.—H. M. Morrow, *RCA.*

Keeping the Amplifier Clean

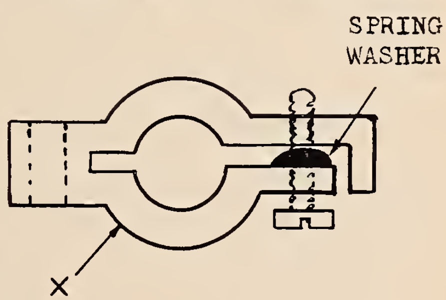
One of the most important minor details of service to sound equipment is keeping the amplifier clean. It would seem that the collection of carbon dust in an amplifier is not an important item and it isn't, from a day to day standpoint. Eventually, however, there will be a thick collection of carbon dust on the wiring and inner parts of the amplifier. It will be noted that the dust is heaviest at places where there is positive high voltage.

Of course, carbon dust will carry current, depending upon the density of the dust. The result readily can be seen if a grid resistor is located near a plate resistor or transformer. By actual test, on several occasions, the amplifier gain increased after the carbon dust was removed.

With the present-day tube situation, it would be well to clean the amplifier before replacing tubes and so bring up the gain a few points. A stiff paint brush is ideal for this purpose.—F. Van Brocklin, *ALTEC.*

Extending Life of Exciter Lamp Holder

By including a washer to equalize the strain at point X, as shown in the diagram below, the exciter lamp sockets can be used a great deal longer without



breakage as well as simplifying exciter lamp adjustment.—R. L. Hardy, *RCA.*

Replacing No. 19 Lead Covered Wire on W. E. Equipment

In the case of many W.E. installations the # 19 hard drawn copper pair with lead shielding has been found to deteriorate due to the rubber becoming brittle and powdery, thereby causing grounds and short circuits. Care should be taken not to disturb these leads, but when alterations are made this is not always possible. In the event that a hum (not traceable to either 49-amplifier) develops and apparently comes from the leads, it

(*Continued on page* 28)

NEW PLANS NEEDED

(*Continued from page* 10)

the greater part of its output, since the requirements of loud speakers and exciter lamps are comparatively small. If there is no emergency arc supply, as there should be, still other arrangements are possible for the loud speakers and exciter lamps.

The p.a. loudspeakers—or even two or more large radio speakers, if they have been obtained in advance—can be wired and matched to the regular sound amplifier through an impedance matching and switching circuit previously laid out. Sound won't be nearly as good; quality, volume, distribution and illusion all will suffer, but the show can go on.

It the theatre has a substantial reserve of flashlight batteries in its ushers' room a sufficient number of these, wired in series-parallel and changed frequently, can be used to light the exciter lamp. The projectionist will remember it is not too easy to connect and change many flashlight cells—time and soldering are needed. If he intends to rely on that resource in cases of exciter lamp supply trouble it will be well to make up some form of contact box, with clip or spring contacts, so that cells in suitable number and circuit can be inserted and promptly replaced.

Another emergency remedy for exciter lamp supply trouble is to light the lamps from the 110-volt a.c. or d.c. line through a bank of ordinary light bulbs connected in parallel with each other, the whole bank being in series with the exciter lamp. A sufficient number of light bulbs will have to be used to pass the current the exciter lamp needs. By using a larger number of small light bulbs, rather than a few larger bulbs, the current to the exciter lamp can be regulated with greater precision by adding or removing bulbs from the parallel circuit.

Volume Control Substitute

This haywire resource has another function also; it can be used, within limits, as a sort of unsatisfactory volume control substitute in cases of serious volume control trouble. By using a large number of comparatively small light bulbs (such as the 10-watt size) the current to the exciter lamp can be regulated in steps of 1/10th ampere, and sound volume controlled in that way. Modification of exciter lamp current is not the most desirable way to control volume. Further, if control is effected by screwing 10-watt or smaller light bulbs in and out of their sockets a click will be heard every time volume is changed unless care is taken to make such changes during silent moments, at which times a modern noise-control soundtrack will be opaque and the click will be weak or not heard.

All of the various emergency resources mentioned herein are, in fact, in the category of heroic measures, or rather more than that. Using *B* batteries to replace a defective power circuit may fairly be called an extreme procedure; then substituting the power pack of a p.a. amplifier because *B* batteries can't be obtained certainly counts as ultra-extreme. But it will work, if properly prepared in advance; it will keep the show going when there's nothing else left to do. The same applies to all of the above war-time substitutes for the last-ditch methods of former days.

The diligent projectionist will recognize that he may, sometime, be driven to such heroic procedures, and he will make thorough preparation for them. But he will also exhaust every possibility of external service, frequent and complete inspections, prompt repair of the smallest faults, and immediate replenishment of every gap in his spare parts stock. He will prepare for extreme remedies while doing everything humanly possible to minimize the chance that his projection room will ever need them.

CLARIFIES EQUIPMENT ORDER

The War Production Board recently clarified the meaning of the terms soundhead, amplifiers, loud speakers and projection arc lamp houses, used in the definition of 35-mm. motion picture equipment. The definition now reads: "35-mm. motion picture projection equipment means complete projectors, projector mechanisms, pedestals, bases, complete sound systems, complete sound heads, complete amplifying systems, complete loud speaker systems, complete projection arc lamp and lamp house units, complete projection arc current converting devices, and complete portable projectors, for use in exhibiting 35-mm. films."

Order L-325, 35-mm. Motion Picture Projection Equipment and Accessories, was amended to make the clarification.

DE STEFANO REJOINS NATIONAL

A. de Stefano, known to the trade as "Count," has rejoined the staff of the National Theatre Supply Co. as manager of their Kansas City office, W. E. Green, National president, announces. Mr. de Stefano, who is well nnown to exhibitors in the Southwest, formerly was manager of the company's Memphis, Los Angeles and Dallas branches.

J. W. Shreve will actively continue his sales work in the Kansas City territory.

IN THE SPOTLIGHT

(*Continued from page 17*)

Summed up this means that new channels of employment will be opened to the craft—the showing of films, both 16- and 35-mm., in schools, colleges, churches. hospitals, industrial plants, etc., should mean more jobs for our men, and local officials should make it their business to see that they are filled by I. A. members.

● John Hurley, projectionist at the New York Paramount Theatre, was surprised recently when his soldier son, Pvt. Harry Hurley, paid him a visit at the theatre. Young Hurley is attending classes at the Rhode Island College, Ningston, R. I., where he is studying electrical engineering.

● Charles Beckman, Jr., son of Local No. 306 financial secretary, has been obligated as a member of the union. Welcome to the fold, Jr.

● Some of our readers seem to be laboring under the impression that the members of the 25-30 Club are all a bunch of a.k.'s. Of course, we have a few members who are not exactly in the lollypop stage, such as Cecil R. Wood, Sr., Henry Weinberger, Mike Berkowitz, and a few others, who can remember when New York was a horse-car and gas-lighted city, and when bicycles for two were quite dashing, but the majority of our members are in the 40's and not a few of them think they are quite the berries, if you get what we mean.

The other day we received a note signed by three of our very good friends, members of Local No. 233, Buffalo, N. Y., proudly boasting that despite their combined ages of 192 years and their combined projection experiences of 117 years, they consider themselves to be in the prime of life and are enjoying life in its fullest. These "shrinking violets," Walter Machette, 59, Mike Ostrowski, 63, and Fred Taylor, 70, wish to join the 25-30 Club, basing their claim for membership upon their combined 192 years. As chairman of the Investigation Commitee, we shall bring this matter to the attention of the club members at the next meeting. Hold on just a little longer, boys, something may happen.

P. F. THOMAS NAMED TREASURER OF ALTEC SERVICE CORP.

P. F. Thomas has been elected treasurer of Altec Service Corporation, it is announced by G. L. Carrington, president of the organization. Mr. Thomas takes over the duties of treasurer from H. M. Bessey, who recently was elected vice-president. In announcing the promotion Mr. Carrington emphasized the company policy of promotion-within-the-organization of men of outstanding ability and loyalty.

MOT. PIC. PROJECTION IN FRENCH NO. AFRICA

(*Continued from page 20*)

oblivion. It won't matter if you are waved to oblivion with it because on Capri you're not a live person, only a dream figure moving through the landscape of a dream. Yet American pictures are shown on the Isle of Capri.

But you can look and look for a theatre and never see one. A theatre is just another house. It has no sign, no marquee, no box office. no price list and not so much as a bulletin board to tell you what is playing. Attractions and their dates are advertised in store windows in the little towns; and if you can guess which house contains the theatre you may go to the movies. This isn't particularly odd in Wonderland; if you found the Seven Dwarfs were the projectionists that wouldn't surprise you either.

One theatre was visited. It is located on a cliff overlooking the sea. The auditorium has a polished hardwood floor and 400 ordinary household chairs of polished wood, with high, straight backs. These are placed in rows on the shining floor. as in a meeting room. In the seaward wall there are tall French windows which have been darkened — somewhat — with blue paint. They open to give access to a little outdoor platform that has tile flooring and small tables, and is set at the very edge of the cliff. The sea sobs around the rocks, forming blues and greens that would be rejected in Technicolor as obvious distortions.

Probably this outdoor platform and its tables are important in view of the limitations of the projection room, for this theatre shows full-length features with only one projector, and no doubt the audience moves outside to sip cognac while the operator changes reels. If anyone ever goes back in and looks at a picture, instead of staying out to look at the scenery, that would be just one more incredibility of an impossible Island of Oz.

A second projector could not be forced into that booth with a crowbar. Your home has closets that are larger.

The amplifier is Italian with a mixed tube line-up; Italian Fivre 5Z3 and 2A6 tubes (exactly like their American counterparts), RCA 56 and 45, and a push-pull output stage of old style, oversize Cunningham 50s. An obsolete table model radio speaker of about the era of 1923 is the monitor.

The projector is another of those antique Ernemanns. The lamphouse is of the reflector type, very old and very small. It is smaller than those used with the smallest size American 35-mm. portable arc equipment. There is no maker's name. The carbons are less than 6″ long, arranged horizontally, and apparently not American.

The pedestal is a brick chimney. looking exactly as if it had been borrowed from somebody's roof. Santa Claus, however, was missing.

ALTEC SERVICE CONTRACTS

The Interboro Circuit of 21 theatres has re-signed its service and parts contract with Altec Service, Bert Sanford, New York district manager, announced.

A. MacIntyre has negotiated a deal with the Joy Houck Circuit, of New Orleans, which has contracted with Altec to service and furnish repair and replacement parts for the sound reproducing equipment in their 35 theatres.

Baehr Circuit, of Brainerd, Minn., has signed an agreement with Altec for repair-replacement parts, booth parts and service on their 12 theatres in Minnesota. O. E. Maxwell negotiated for Altec.

Altec's Seattle district manager, Barclay W. Ardell, announced a deal with A. W. Adamson, of Vancouver, Wash., for Altec service in his six theatres. Other theatres in the Los Angeles and Seattle area recently contracting for service are: Bay, Alameda, Cal.; Vista, El Cerrito, Cal.; Roxy, Meridian, Idaho; U. S. Naval Hospital, Seattle; Victory, Henderson, Nev.; Fox Preview Room, San Francisco; Burk, Midvale, Utah, and Panida, Sandpoint, Idaho.

FILM REGULATIONS

(*Continued from page 22*)

non-combustible flue used for no other purpose. Exhaust capacity shall be not less than 15 nor more than 50 cubic feet per minute for each arc lamp plus 200 cubic feet per minute for the room itself.

Systems shall be controlled from within the enclosure and have pilot lights to indicate operation. The exhaust system serving the projection room may be extended to cover rooms associated therewith such as rewind rooms. No dampers shall be installed in such exhaust systems. Ventilation of these rooms shall not be connected in any way with ventilating or air conditioning systems serving other portions of the building.

(h) Exhaust ducts shall be of non-combustible material, and shall either be kept one inch from combustible material or covered with ½ inch of non-combustible heat insulating material.

(i) Fresh air intakes other than those direct to the open air shall be protected by approved fire shutters arranged to operate automatically with the port shutters.

(j) Provisions shall be made so that the auditorium lights can be turned on from inside the projection room and from at least one other convenient point in the building.

1 The term "fireproof" is used as defined in the Building Code of the National Board of Fire Underwriters and as having in these regulations the same meaning as the term "fire-resistive" as used by the National Fire Protection Association.

Ideal Military Projector Discussed at Meeting

At the initial meeting last month of the newly established branch of the War Standards Committee on Photography and Cinematography, held at GE's Nela Park, Cleveland, quarters, thirty-five experts from the film industry and the armed forces gathered for three days with General Electric engineers to devise a suitable 16 mm sound motion picture projector for military needs. It is expected that specifications drawn up will be adopted at a subsequent meeting.

Frank E. Carlson, illuminating engineer at Nela Park, was host to the group, with those present being from all parts of the country, from the Army, Navy and Marines, from leading makers of projector equipment and motion pictures, from film processing laboratories, from the Society of Motion Picture Engineers, and from GE's Nela Park engineering division.

Capt. Lloyd T. Goldsmith, of the Army Signal Corps, among those present, said that at present "there just isn't any adequate 16-mm military projector to meet the special requirements of the armed forces to train, educate and entertain troops here and overseas by way of the motion picture.

Representatives of manufacturers included Bausch & Lomb Optical Co., Eastman Kodak, National Carbon, Bell & Howell, DeVry, RCA, Ansco, and Ampro. RCA's production manager, A. G. Zimmerman, served as chairman; and the SMPE was represented by D. E. Hyndman, of Eastman Kodak.

RCA ANNOUNCES EQUIPMENT FOR CIVILIAN PURCHASERS

RCA announces, through Homer B. Snook, manager of theatre equipment sales, that a limited quantity of its motion picture equipment will be made available to civilian purchasers during the first half of 1944. The means for obtaining WPB approval of such sales are provided under WPB Limitation Order L-325. This equipment includes small- and medium-size RCA sound equipment, BX-80 Brenkert projectors, N-100 Enarc lamps, BX-12 bases, 5035-type tube rectifiers, and PR-76 copper oxide reflectors, dealers are advised. Some of this equipment is available for immediate shipment.

Exhibitors who may be eligible for such equipment under the limitation order are, roughly, those who can show that replacement of such equipment is necessary for the maintenance of civilian morale in their communities, or for other reasons related to the war program.

AT YOUR SERVICE

(*Continued from page* 23)

is well to bear in mind the fact that some of the leads that were originally run in lead, could have been unshielded wire such as is found in the 90-volt supply wires.

In this respect twisted pairs will satisfactorily carry signals from either soundhead to the fader and from the fader to the 46, or other amplifier, with no hum pick-up if a little care is taken. It is possible to cut loose a grounded wire and substitute wires run in a new conduit run using # 14 unshielded, or any suitable wire, or by borrowing another lead run and using unshielded conductors for the run least requiring the shielding.

This all becomes necessary due to the unsatisfactory results obtained by removing and repulling all the leads in the crowded conduit, as the # 19 wires are apt to kick up a lot of trouble. In one particular case, the writer had only # 14 lead covered available for replacement, and the conduit under repair would not accommodate this. The separate run was made of ½ inch thin wall conduit and the signal and the 90-volt wires were run in it. All the other wires were then pulled, the # 19 wires were discarded and plain # 14 was found satisfactory for the rest of the leads.—A. F. SCHNEIDER, *RCA*.

Eliminating Radio Interference

A call was made in response to the request of the manager of one of the theatres in my territory to check for the cause of the system picking up radio programs from a radio station, whose antenna is located on the roof of the theatre. The noise was completely eliminated by strapping the 12V terminal to the ground terminal at TS-2 of the 46-type amplifier.—F. B. EVANS, *ALTEC*.

Conservation of Meter Batteries

With the wartime restriction on sales of "C" batteries, the following method has been found very successful in retaining the operation of Weston # 772 Analyzers. When the 1½ volt sections on both "C" batteries get too low, it is impossible to get a zero setting on the low resistance scale. By adding a # 2 cell, flashlight battery in series on the negative end of the "C" batteries and moving the leads so as to utilize the new cell, new battery operations may be obtained. This cell can readily be mounted with a strip of tin and a short wood screw.—HARRY M. MORROW, *RCA*.

Keeping Universal Joints Lubricated

The universal joints on W.E. universal bases can be kept well greased by making a short canvas band, clamping it to the upper and lower hubs of the universal joints after they have received a copious supply of cup grease. The bands can be fastened on, allowing room to get at the Bristo set screws.—A. F. SCHNEIDER, *RCA*.

Volume Control Contact Cleaner

I find this miracle worker quite a help in keeping volume controls clean and noiseless. It is contact and crystal cleaner # 1274, manufactured by the General Cement Co., Rockford, Ill. It costs but thirty cents for a four-ounce bottle, and also is excellent for cleaning tube prongs and socket contacts when oxidation and dirt make them noisy.—LES LEIDY, *RCA*.

Conserving Resistor Bands

The copper bands on adjustable resistors where considerable heat develops binds when an attempt is made to adjust the band. Forcing the threads usually strips them or bends them out of shape. On several occasions I have drilled out the threads and used a brass or iron nut which I found to be more heat resistant.
—A. H. CLOW, *RCA*.

Permanent Magnet Holds Lower Magazine Door Open

The cleverest stunt that I've seen for holding open the lower magazine door consists of mounting a small permanent magnet at a suitable place on the front wall. It holds the door nicely and doesn't mar the finish.—H. J. BROWN, *ALTEC*.

Sound Loss Traced to Defective Resistors

No sound was reported by the theatre. The 91-B amplifier power transformer was hot although the fuses did not blow. The 274 tube also was hot. All glass-

(*Continued on page* 30)

I. A. ELECTIONS

(*Continued from page 14*)

W. F. Hyder; *recording secretary*, A. V. Hoenscheidt; *secretary-treasurer*, J. M. Ealy; *business agent*, J. M. Ealy; *sergeant-at-arms*, S. F. Weidman; *financial committee members*, A. V. Hoenscheidt, H. Voss and W. F. Hyder.

L. U. 407, SAN ANTONIO, TEX.

President, Charles Bruening; *vice-president*, Genaro Garcia; *recording secretary*, Benno Kusenberger; *financial secretary*, Eugene Muller; *business agent*, John D. Dennis; *trustees*, Alfred Pena, Robert Dennis, and Manuel Perales. John D. Dennis was elected *delegate to the I. A. Convention*.

L. U. 414, WICHITA, KANS.

President, F. E. Welsh; *vice-president*, E. L. Jeffress; *secretary*, C. D. Peck; *treasurer*, C. I. Hedges; *business agent*, W. A. Lee, and M. L. Kickel, *sergeant-at-arms*.

L. U. 444, NEW KENSINGTON, PENNA.

President, Wm. Bordonaro; *vice-president*, Charles Gibson; *recording secretary*, F. P. McCoy; *secretary-treasurer*, J. N. Fike; *business agent*, I. E. Fike; *executive board members*, Joe McCloskey and B. Zamparini; *trustees*, J. Mickelic, C. Wolfe and Howard Wolfe.

L. U. 521, LONG BEACH, CALIF.

President, Ward R. La Bar; *vice-president*, LeRoy A. Ward; *secretary-treasurer*, Alonzo S. Bennett; and Robert J. Taliaferro, *business agent*.

L. U. 628, CHARLEROI, PENNA.

President, James Woods; *vice-president*, Anthony Schmidt; *secretary*, K. A. McLain; *financial secretary*, Arison Hodgson; *treasurer*, Paul Schmidt; *business agent*, R. J. Crosby; *trustees*, Wayne Mickelson, Victor McCrory, and Anthony Lorenzi.

L. U. 650, WESTCHESTER, N. Y.

President, Arthur Martens; 1*st vice-president*, Irving A. Weiss; 2*nd vice-president*, Anthony Dente; 3*rd vice-president*, Irving Brickman; *recording and corresponding secretary*, Emil Smith; *financial secretary and treasurer*, Fred Thome; *business agent*, Richard S. Hayes; *sergeant-at-arms*, Joe Mallon; *trustees*, George B. Alley and Albert E. Bell. All the aforementioned officers, with the exception of G. B. Alley and Albert E. Bell, are also *members of the executive board*. Ruth R. R. Rice, was appointed *office manager*.

L. U. 680, HALIFAX, N. S.

President, A. M. Crowell; *vice-president*, S. A. Pring; *business agent*, M. C. Conrad; *treasurer*, W. A. Bezanson; *recording secretary*, L. F. Crowell; *executive board members*, P. Oldfield and E. Waters.

MOTIOGRAPH EQUIPMENT MADE AVAILABLE FOR THEATRES

Fred C. Matthews, partner of Motiograph, in a letter to dealers, announced that a limited amount of Motiograph projectors and Motiograph-Mirrophonic sound systems will be made available for civilian theatre purposes during the current year. This equipment will include small- and medium-size Motiograph-Mirrophonic sound systems (including Models 9-B, M-11, M-911, M-911 dual and M-11 dual), Motiograph Model K projector mechanisms, magazines, and Model 3 projector pedestals.

It is cited that exhibitors who may be eligible to purchase this equipment are those who wish to replace present equipment that is obsolete, completely worn beyond repair, or totally destroyed by fire and, in a few cases, to new theatres where presently existing theatre facilities do not adequately meet a community's needs.

Exhibitors urgently needing new equipment do not require a preference rating. It only is necessary that they place their order with their dealer, who will then apply to the Motion Picture Division of the War Production Board for permission to transfer the needed equipment to the exhibitor.

New Bonding Adhesives

Bonding of dissimilar materials, where conventional methods of welding, riveting, bolting, etc., may not be employed, has presented problems many times, but there is a line of adhesives on the market now that seemingly will bond anything to everything. In the list of materials to be bonded are glass to plastic, wood to plastics, metals to plastics and wood, and metal to metal. Many of the combinations are in commercial use.

AT YOUR SERVICE

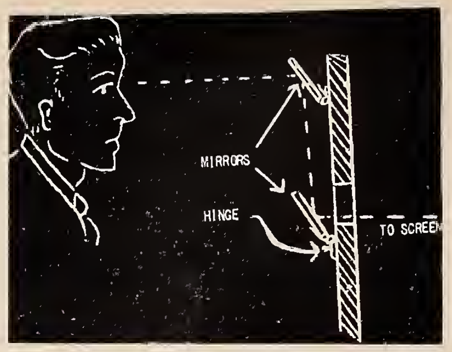
(*Continued from page* 28)

ware had been replaced by the projectionist but no improvement was effected, nor was there any current reading at the percentage meter in the amplifier. Upon investigation it was found that the metallic end of resistor R7 had melted and fused with one end of R10, thereby creating low resistance path for the plate voltage to ground.

Trouble was corrected by replacing both R10 and R7.—F. B. Evans, *ALTEC.*

Broken Backs from Low Port Holes

Lumbago may be relieved by applying a stunt introduced to a number of installations. Two mirrors, approximately 6″ x 8″ were purchased from the "dime" store and hinged to the projection room wall above and below the port hole.



These mirrors may be adjusted according to the wishes of the projectionists, or they may be pushed clear out of the way for direct vision.—Harrod, *ALTEC.*

BACK THE ATTACK
BUY WAR BONDS

Electronics Big War Aid During Past Year

Edward C. Cahill, manager of the industrial and sound department of the Radio Corporation of America, in a survey of the past year, brings out dramatic highlights of the part played by electronics in war industry, morale and training. Film sound recording and reproduction, he states, has made possible new techniques in military training which, authorities estimate, have cut by 40 per cent the time required to instruct recruits.

Barton Kreuzer, reporting for RCA's Photophone Section and sound and Picture Section, declares that large quantities of RCA film sound equipment have been furnished to the armed forces and various government agencies, with such equipment being used for the production and screening of training and orientation films and combat films, and for the screening of entertainment-for-morale films.

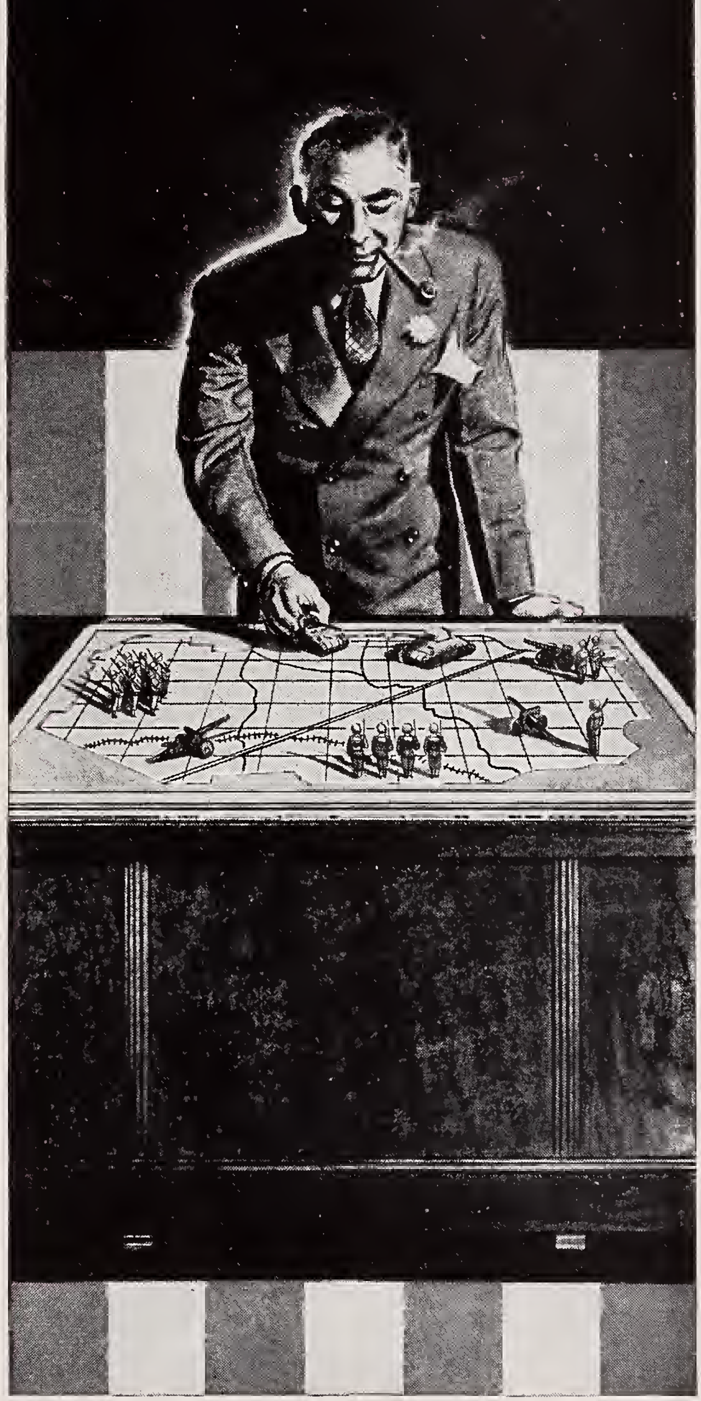
The army alone, he says, is using several hundred Photophone 35-mm projection equipment and several thousand 16-mm sound film projectors. This equipment is scheduled for use in training camps, recreation centers, and base hospitals, and on fighting fronts throughout the world. The company now is making delivery on an order for portable recording equipment amounting to many times a normal year's production.

In addition, more than a score of RCA film sound reproduction systems have been furnished for special government installations at Washington, D. C., including one on the White House and others for the Army, Navy and Marine Corps use. Studio recording systems and mobile recording units have been furnished to government studios in Washington, Anacostia, D. C.; Astoria, L. I.; Wright Field and Hollywood.

Still another field in which RCA is contributing to the war program, the report sets forth, is in the coating of optical lenses to reduce reflection characteristics. As a result, thousands of American troops will be equipped with superior binoculars, telescopes and fire control apparatus. The company's "Magicote" lens-coating process involves the deposition of a very thin chemical film on the working surfaces of the lens.

RCA believes that in the motion picture and sound field 16 mm equipment for the production and screening of industrial and commercial training films will find a large and growing post-war market. Business firms also are expected to make use of sound films for the demonstration of various appliances and other products as a part of their marketing programs. Resumption of civilian production after the war will release a large backlog of demand for theatre equipment to make up for the wartime suspension of normal replacements, the report concludes.

for THIS battle, G.H.Q. is at YOUR own desk!



★ Here's how you—yes, YOU—can carry out a smashing "pincer movement" against the Axis. Swing in on one flank with increased production of war goods! Drive in on the other with redoubled purchases of War Bonds through your Pay-Roll Savings Plan!

You're an officer in both of these drives. Your personal leadership is equally vital to both. But have you followed the progress of your Pay-Roll Savings Plan as closely as you have your production?

Do you know about the new Treasury Department quotas for the current Pay-Roll Allotment Drive? *Quotas running about 50% above the former figures?* You see, these new quotas are based on the fact that the armed forces need more money than ever to win the war, while the average worker has more money than ever before to spend. Particularly so, on a *family income* basis—since in so many families several members are working, now.

Remember, the bond charts of today are the sales curves of tomorrow! Not only will these War Bonds implement our victory—they'll guard against inflation, and they'll furnish billions of dollars of purchasing power to help American business re-establish itself in the markets of peace.

So get this new family income plan working at once. Your local War Finance Committee will give you all the details of the new plan. Act today!

This advertisement prepared under the auspices of the War Advertising Council and the U. S. Treasury Department.

LET'S KEEP ON Backing the Attack!

This Space is a Contribution to America's All-Out War Effort by

INTERNATIONAL PROJECTIONIST

Crowds welcome President Roosevelt speaking before Parliament buildings, Ottawa

IN OTTAWA...

and all the other principal cities of the Dominion of Canada, leading motion picture exhibitors use Simplex Projection equipment to build and maintain the morale of those fighting the war on the home front.

HERE AT HOME Simplex is also the instrument with which top-flight showmen bring relaxation, pleasure and renewed energy to the millions who stand behind the men behind the guns. In their capable hands it has become one of America's most powerful weapons for speeding Victory.

Simplex IN WAR AND PEACE — THE *INTERNATIONAL* PROJECTOR

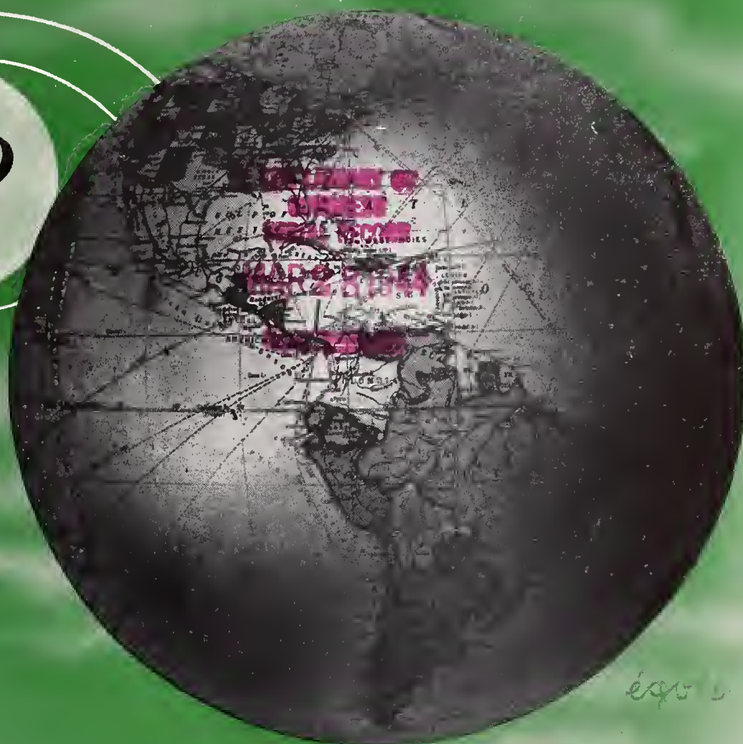
NATIONAL THEATRE SUPPLY DIVISION

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

Simplex

INTERNATIONAL PROJECTOR CORPORATION

INTERNATIONAL PROJECTIONIST

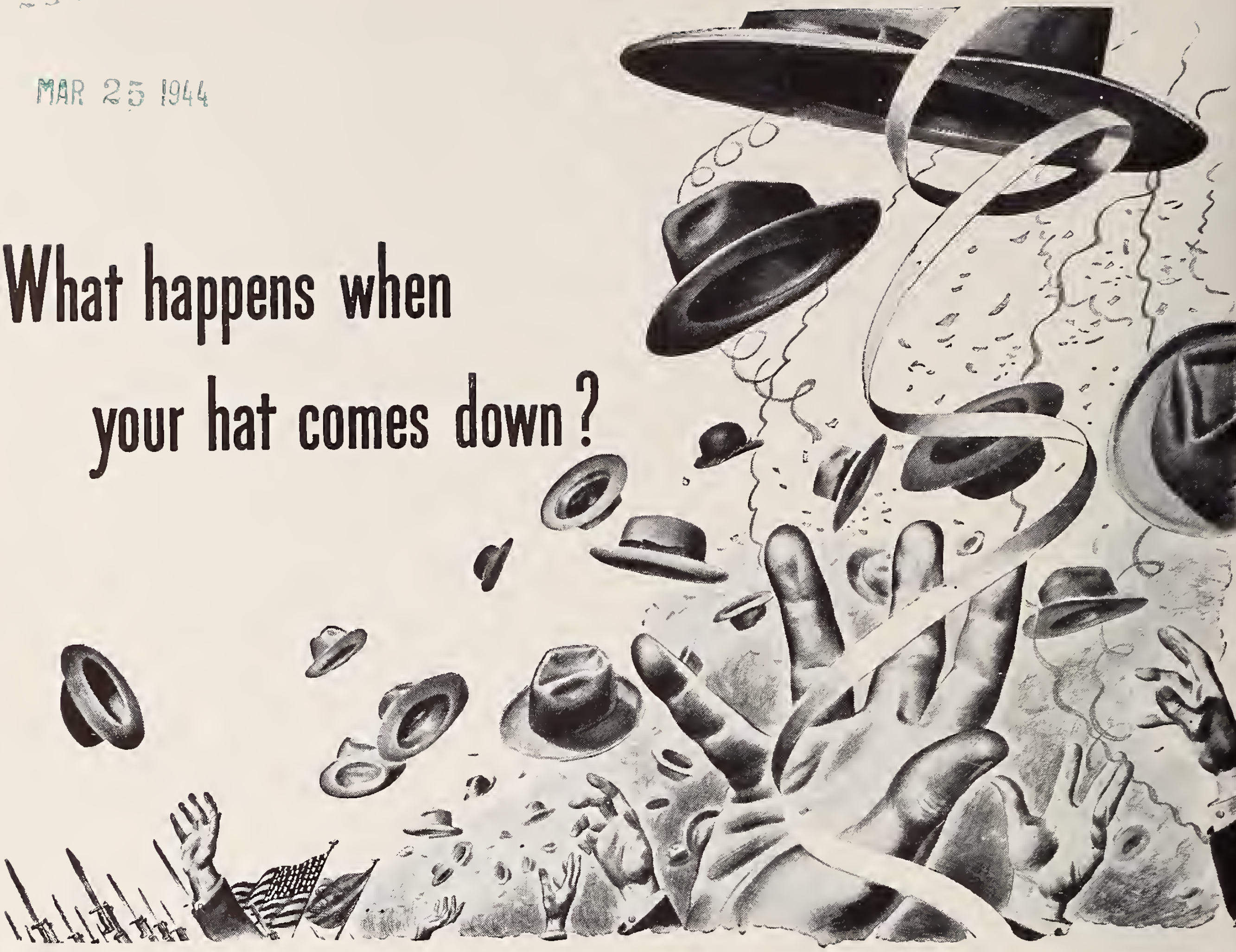


MARCH 1944

VOLUME 19 • NUMBER 3

25c A COPY • $2 A YEAR

What happens when your hat comes down?



SOMEDAY, a group of grim-faced men will walk stiffly into a room, sit down at a table, sign a piece of paper—and the War will be over.

That'll be quite a day. It doesn't take much imagination to picture the way the hats will be tossed into the air all over America on *that* day.

But what about the day after?

What happens when the tumult and the shouting have died, and all of us turn back to the job of actually making this country the wonderful place we've dreamed it would be?

What happens to *you* "after the War?"

No man knows just what's going to happen then. But we know one thing that must *not* happen:

We must *not* have a postwar America fumbling to restore an out-of-gear economy, staggering under a burden of idle factories and idle men, wracked with internal dissension and stricken with poverty and want.

We must *not* have breadlines and vacant farms and jobless, tired men in Army overcoats tramping city streets.

That is why we must buy War Bonds—now.

For every time you buy a Bond, you not only help finance the War. You help to build up a vast reserve of postwar buying power. Buying power that can mean millions of postwar jobs making billions of dollars' worth of postwar goods and a healthy, prosperous, strong America in which there'll be a richer, happier living for every one of us.

To protect your Country, your family, and your job *after* the War—*buy War Bonds now!*

Let's all KEEP BACKING THE ATTACK!

The Treasury Department acknowledges with appreciation the publication of this message by

INTERNATIONAL PROJECTIONIST

Official U S Navy Photograph

The Navy Commissioned Kodak Medalist "as is"

IN THIS WAR, the camera has full military status. From Admirals down, Navy men carry a Kodak Medalist as casually as binoculars. It is the impartial fact-gatherer and reporter of action. You have seen plenty of Medalist shots among the terrific pictures released to newspapers and magazines. But you've only seen a fraction.

* * *

When the war broke, the Medalist had just been created—for civilian camera enthusiasts. Navy experts tried it out. It looked and acted "Navy"—clean, precise, inherently fine—structurally as sound as a battle wagon, compact as a submarine.

The Navy bought every Medalist available "as is," ordered production stepped up. Since then, wherever units of our fleet have operated—from PT boats to capital ships and aircraft—the Medalist has seen action. Twice as many were on duty the second year as the first.

After the war, the battle-conditioned Medalist will be at your service in civilian life. Eastman Kodak Company, Rochester, N.Y.

A fistful of efficiency, the compact Medalist produces full-scale pictures—$2\frac{1}{4}$ x $3\frac{1}{4}$ inches. The lens, Kodak Ektar $f/3.5$—incorporating Kodak's revolutionary new optical glass—assures pictures of incomparable clarity and brilliance, either in black and white or full color.

Lens and Kodak Supermatic Shutter are mounted in a unique helical gear focusing tube which provides hairline focusing, with unequaled rigidity. All operating controls, in "shooting" position, are at the fingertips. The eyepiece of the split-field range finder is directly below the view finder.

The Medalist, optically and mechanically, is an achievement of the Kodak experts responsible for the latest gunfire control apparatus used by our armed forces.

REMEMBER "TAKE HER DOWN"? . . . *how the wounded submarine skipper, Commander Howard W. Gilmore, U. S. N., ordered his men to "Take her down"—leaving him outside the conning tower? His was a stern example to us at home.* **BUY MORE WAR BONDS.**

Serving human progress through Photography

Is your boy out there . . .
in the land that God forgot?

IS he slogging along some muddy road . . . or huddled beneath a leaky tent? Do you see him now, thirsty beneath a broiling sun?

Or is your boy fighting a wintry blast in the land where winter never ends? . . . Yes, millions of people worry tonight for the men in the lands that God forgot.

But if your heart is sick with longing for some special boy . . . remember this and find comfort . . . wherever he may be, in the frozen wastes of Iceland or the jungles of New Guinea . . . you can reach out and give your boy some little comforts that speak of home.

He will get coffee, doughnuts and other American comforts when the long march is over . . . thanks to you.

He will sleep between sheets when he gets his furlough, in a town ten thousand miles from home . . . thanks to you. Even should he be a prisoner of war, he won't be condemned to live on alien bread. For every week the Red Cross will carry to him a carton of food. Yes, eleven full pounds of real American food, the kind you used to give him at your own table. And real American cigarettes and tobacco!

He will get all this . . . and more . . . straight from *your* heart through the Red Cross.

Because the Red Cross is *you*—the Greatest Mother in the World, because it represents all the mothers of America. The Red Cross is your blood and your bandages, the sweaters you knit and the gifts you pack.

And the Red Cross is your money too! This year when your Red Cross has a bigger job than ever before to do . . . this year when your Red Cross is serving your own sons in every corner of the globe . . . this year you will want to give more, more of your time, more of your work, the blood from your heart...and more of your money to help the work go on.

So dig deep and be glad. For wherever he is

GIVE TO THE
RED CROSS

The RED CROSS is at his side
and the Red Cross is YOU!

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

IN PROCESS of being printed by International Projectionist is a hand-book for projectionists which will prove of immeasurable aid when something goes wrong with sound or track systems. It is felt by the editors that the work will be doubly valuable during the war period. when replacements often cannot be secured as quickly as once was the case. Data have been collated and departmentalized from the practical and popular "At Your Service" section of I.P. which has appeared during the last several years. and will prove valuable first aids when practically anything goes wrong in the projection room. Further information as to publication date will be released in the near future.

• • •

Officials in Washington have let it be known that the country cannot look for widespread reconversion to peacetime goods until the war effort has progressed much further than now is the case. While many people had believed that this year would bring about large-size conversion to consumer goods and industrial replacements. such a view has been submerged to a great extent by the latest views of official Washington. The period for extensive reconversion. apparently. hinges on the invasion of Europe and the time it is going to take to give the Allied Nations absolute supremacy. These current expressions are highly important to projectionists who may have thought that the worst period was over, and that there is no need for continuing extreme conservation of available equipment and supplies. If anything. it is more important now than ever before to make what you have last as long as possible—and maybe a little longer.

• • •

The articles on "Television Today", by James Frank, Jr., which have appeared in I.P. for the past several months. and which will continue, have been the reason for much favorable comment on the part of projectionists. Mr. Frank presents his data in down-to-earth language that takes much of the mystery out of television. and projectionists are indebted to him because it is highly essential that they keep abreast of the changing television picture. Television will be in motion picture houses after the war, and the more projectionists know of it the better off they will be in adhering to their job of keeping the show going. Suggestions have been made that the entire series be reprinted in pamphlet form when it is completed, with the editors of I.P. expected to make a decision on that score shortly.

IP INTERNATIONAL PROJECTIONIST

VOLUME XIX MARCH 1944 NUMBER 3

Flicker: Its Causes and Remedies†

By *R. HOWARD CRICKS, F.R.P.S.*

AT A recent meeting of the British Kinema Society a particularly interesting question arose on the subject of flicker due to a single-phase rectifier, which was apparent with a rear-shutter projector but not on the front-shutter machine. There are many points of interest in the study of flicker.

In the first place, make two simple tests. Run your projector without film on a white screen, with the house lights off, starting with the arc run at a low current—probably no flicker will be seen. Now increase the arc current; a flicker will become visible. Then switch on the house lights—probably the flicker will again disappear.

Now thread the projector with a piece of film of average density, strike the arc and run up to full current, switch on the motor and before it is up to speed open the dowser. While the machine is running slowly you will again see flicker, which will vanish when the motor reaches full speed.

These tests suggest that the perception of flicker is dependent upon two factors: (1) the intensity of light, or, to be more exact, the difference between the light and dark periods (by switching on the house lights we reduced this difference, and so reduced or cut out flicker); and, (2) the speed of the flicker. Actually the perception of flicker is a logarithmic relation with both these quantities; so exact is this relationship, even with different individuals, that one type of photometer measures the intensity of light by the highest rate of flicker that can be perceived by the eye.

† Ideal Kinema, Dec. 1943.

Flicker Made Invisible

We all know that the reason a projector has a two-bladed shutter is to increase the rate of flicker and so make it unnoticeable. This suggests that with the normal screen intensities used, flicker is visible at 24 cut-offs a second, but becomes invisible at 48. Further information on the subject is given by the fact that in silent days when the projector ran at 16 to 20 frames per second, the shutter usually had three blades; a two-bladed shutter run at these speeds gave rise to flicker, which indicates that at a cut-off rate of 32 to 40 per second flicker is still visible. This is a very rough-and-ready way of studying the subject of flicker, which actually can be discussed in a more scientific manner. But the conclusions will serve for our purpose.

The conclusions are of practical interest in one respect—they suggest that if screen brightness is too high flicker will appear. Therefore there is a practical limit to screen brightness unless we are to revert to a three-bladed shutter.

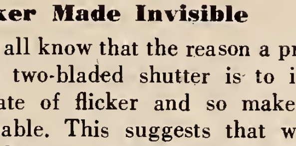

FIGURE 1

*Single-phase rectification**

Actually, there are two other factors connected with the perception of flicker. The first is the manner in which the light is cut off. Experiments by the classical authority on the subject, the German scientist, Von Helmholtz, indicate that a gradual cut-off of light is less productive of flicker than an abrupt cut-off. The second point is that a shutter with equal periods of light and dark will cause greater flicker than if the periods are unequal. There is room here for investigation by projector manufacturers.

Still another factor can be noticed by looking to one side of the screen. Often one will notice flicker out of the corner of one's eye, which vanishes when the screen is viewed directly. This point of why flicker should be more noticeable at the side of the retina merits consideration.

In the days when our ancestors lived in caves and went about in fear of the sabre-toothed tiger and such fearsome beasts, it was of vital importance that, while a hunter's attention was concentrated upon the inoffensive dinner he was stalking, he should still be able to notice any movement around him which might indicate the presence of a more unpleasant beast also looking for a dinner. The eye developed the faculty of noticing movement to the side of the line of vision.

This life-saving precaution of nature

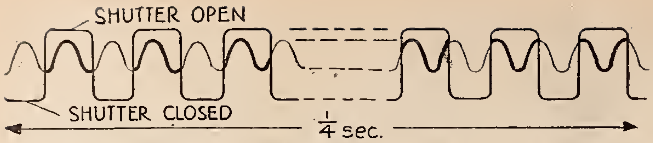

FIGURE 2

*Interaction between single-phase rectified current and projector shutter**

persists to this day and in our particular application it means that while flicker in a picture may be unnoticeable in the portion we are actually looking at (in other words, the part whose image falls upon the center of the retina), it will be noticeable on the margin of the field of view—that is, around the edges of the retina.

This indicates first that the viewing angle from the front seats must be limited because the perception of flicker causes eye-strain. Another point found particularly in some older kinemas is that the screen may be flanked by light-colored surfaces which are capable of reflecting light off the screen back to the eyes of the audience. Nothwithstanding the lower intensity of the reflected light, one can often notice flicker on such surroundings when on the screen itself it is invisible.

Smooth Current Supply

So far we have assumed that the light from the arc is perfectly steady and flickerless. A motor-fed arc supplied with direct current and properly adjusted approaches this ideal steadiness. But arcs fed with a fluctuating supply do not.

Most arcs these days are run not on d.c. but on rectified a.c. The type of rectifier is for our present considerations immaterial; what is important is, first, the nature of the a.c. supply, and secondly, the nature of the smoothing circuits. Several rectifier manufacturers refuse to install single-phase rectifiers in kinemas because of this very question of flicker.

Consider the wave-form of the output from such a rectifier. Figure 1 shows in dotted lines the original a.c. supply, and in light lines the unsmoothed output, which it will be seen has a flicker frequency of double the mains frequency—that is, generally of 100 cycles per second. With the ordinary d.c. type of arc this flicker is reproduced in the arc flame, and hence on the screen.

Now it would be possible, by the use of large chokes or condensers, to almost completely smooth out the ripples shown (every mains-fed amplifier does it). But such smoothing would be extremely inefficient and costly to run. Therefore, the average single-phase rectifier contents itself with a partial smoothing, and has an output similar to that shown in the thick line.

It may be objected that since this flicker has a frequency of 100 cycles per second, it will be too fast to be visible. If your arcs are fed from such a rectifier, switch on the arc with the projector stationary and examine the screen—probably no flicker at all will be seen. Now switch on the motor and flicker will almost certainly appear, but at quite a low frequency, nothing like the flicker due to the shutter when running with a d.c. arc. Why is this?

Figure 2 gives the explanation. Here we have the shutter opening periods superimposed upon the wave form of the supply. Now, the shutter is open each time for a little over 1/96th second (that is, a quarter of 1/24th), and by following the heavy line it will be seen that the total amount of light reaching the screen in successive shutter openings will vary. Actually, the interaction between the 48-cycle cut-off of the shutter and the 100-cycle variation in the supply will produce a flicker frequency of 2 beats per second. This particular frequency is very difficult to eradicate; all one can do is either to minimize it by fully loading the carbons so that they will no longer cool down so quickly when the current drops (this, of course, is the principle of the modern a.c. arc), or ensure that the shutter opening is exactly 1/100th of a second, when the phasing between shutter and supply will be immaterial.

Most rectifiers work on three-phase mains where they are available, and actually give a six-phase output, as shown in Figure 3. The current from each phase overlaps and even without smoothing there would be no perceptible flicker, because the frequency thus becomes $50 \times 6 = 300$ beats per second—too high to give rise to much flicker in the arc, and too high to interact with the shutter.

We have so far discussed the two causes of regular or cyclic flicker-shutter cut-off and current pulsations. A factor that must not be overlooked is flicker due to the arc itself. An arc is an inherently unstable piece of apparatus, and needs considerable care in operation if it is to give a steady light.

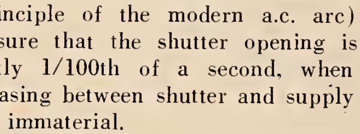

FIGURE 3. *Three-phase full-wave (six-phase) rectification*

In September 1938 issue of "Ideal Kinema" there were published certain charts showing light records of six types of arcs over a period of about four minutes. It is very noticeable in these charts that a rotating positive arc produces a definite light fluctuation in time with the rotation of the carbon. Another point demonstrated, in the case of the h.i. mirror arc, is that a horizontal negative carbon tends to cause flicker: a curve of an arc of this type shows very much more flicker than curves of arcs having an inclined negative.

To eliminate this source of flicker a projectionist must get the "feel" of his arcs—he must learn to adjust the carbons to obtain the maximum possible light without flicker. This adjustment will, of course, be indicated by the arc voltage, and I have always urged that every arc should be fitted with a voltmeter.

* England uses the 50-cycle current and the time element used in these diagrams is based on that standard. On the basis of the standard American 60-cycle current, Figure 1 would read 1/60th second and Figure 2 would read 1/5th second.

RED CROSS MOVIES SHOWN TO 15,000,000 IN HOSPITALS

The American Red Cross Hospital Motion Picture Service, organized in the Fall of 1941, last year showed to an aggregate audience estimated as well in excess of 15,000,000 of Uncle Sam's wounded and ill. The service, although only a little more than two years old, ranks about third among national circuits, it is said.

At the turn of the year the service had 167 standard 35-mm set-ups installed in recreational buildings and halls at base and station hospitals. By an arrangement with producers and distributors the latest productions are made available to the service at a nominal rental.

Supplementing the showings in recreation halls 16-mm portable sound equipment brings movies right into the wards so that bed patients will not be deprived of this recreation and entertainment. This supplementary service showed to about 5,000,000 patients.

In January the ward movie program had in operation 416 machines and it is anticipated that by July the number will have grown to 500. In order to expand further the program for ambulatory patients the service has made plans to install 16-mm dual arc equipment in recreation buildings and halls, due to shortages of standard equipment.

DE VRY NAMED DEPOSITORY FOR OWI FILMS

DeVry Films & Laboratories has been named a depository for Office of War Information films which are now available. It also is announced that the company, which is a subsidiary of the DeVry Corporation, has available the 16-mm film-on-sound edition of the British war epic, "Desert Victory". Lieut.-Col. David MacDonald, under whose direction "Desert Victory" was filmed, states that 95 per cent of its footage was made with DeVry 35-mm motion picture cameras.

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RADIO CORPORATION OF AMERICA

Analysis of a Medium Power Amplifier

By *LEROY CHADBOURNE*

THE AMPLIFIER diagrammed in Figure 1 contains many conventional features and a few that are distinctive. It is a single unit voltage and power amplifier operating directly from photocells and supplying photocell bias voltage through its power circuits. In addition, the circuit shown provides field excitation for not more than two dynamic speakers. The mechanical construction is such that the sound changeover switch which is part of the amplifier circuit can be mechanically coupled (through arrangements at the back of the chassis) with the picture changeover mechanism. In practice, therefore, the projectionist need only throw over the switch on the face of this amplifier.

Power output from the pushpull stage is rated at 12-15 watts, gain 90 db. Frequency response is flat within 2 db between 50 and 10,000 cycles with the tone controls set for "normal" operation; however, this response can readily be varied to a very considerable extent as local conditions may require. Phonograph and microphone input circuits are provided. Some types of dynamic microphones (and of course all carbon microphones) need operating current; microphone current is supplied by the amplifier power circuits. There is also an "equalizer" that can be used to balance the volume from the two photocells by altering their exciting voltage. Provisions for supplying exciter lamp current are not part of the circuits of Figure 1.

Filament Supply Circuits

Power supply from a standard a.c. line enters the diagram at bottom, center. S-2 is the power switch; S-5 provides adjustment for either low or high line voltage; a 2-amp. fuse protects the amplifier. The load of this circuit is the primary winding of the power transformer.

The topmost secondary of the power transformer supplies the filament of the upper tube of the output stage. This is indicated in the drawing, not by connecting lines but by the initials R, R (meaning red wires) which appear at the terminals of the topmost secondary of the transformer and at the filament terminals of the upper output tube. Just to the right of the transformer secondary there is a resistor, R-26, bridged by a condenser, C-18. This (as will be seen later) is the grid bias resistor for the upper ouput tube. The condenser acts to filter momentary changes in the current through the resistor and therefore tends to keep the grid bias constant in spite of changes in sound volume.

Returning to the transformer itself, the second secondary from the top, with its terminals designated BL, BL, presents an exactly similar arrangement. It supplies the filament of the lower pushpull tube. The next secondary down, the third from the top, delivers low voltage a.c. for the heaters of the first three amplifying tubes. Its terminals, designated Y,Y, connect to a single pair of wires, and branches from that line run to each of the three heaters (the tube terminals of which are similarly marked Y,Y,Y). These three heaters, therefore, are connected in parallel to each other, across a common line.

The fourth secondary from the top lights the filament of the rectifier tube, which is drawn just to the right of the fifth secondary. In this simple circuit the top and bottom terminals of the secondary are the terminals of the source of the current, the filament prongs of the tube are the load terminals; but every part of this circuit also is a part of the plate power circuit of the amplifier, and the center tap of the fourth secondary, together with its connecting wire, belongs exclusively to the plate power circuit.

The fifth or bottom secondary of this transformer supplies plate voltage to the full wave rectifier tube; its grounded center tap is the return or negative terminal of the plate power circuit.

It doesn't matter particularly whether the plate power circuit and its branches are traced from negative to positive or the other way round. Since the plates of the rectifier tube are connected to the opposite ends of a transformer secondary, they will alternately become positive and negative. Electrons emitted from the heated filament of the rectifier tube go to whichever plate is momentarily positive, thence to the center tap of the bottom secondary, thence to the "ground" or chassis.

There are a number of other "ground" connections to this chassis. One, for example, is wired through R-26 to the center tap of the uppermost secondary of the power transformer. Electrons can flow through this connection, through R-26 and through the center tap of the top secondary to points R,R; thence to points R,R at the filament terminals of the upper pushpull tube.

This component of current in the red wires flows in the same direction in both wires, which so far as this current is concerned are connected in parallel to each other, although at the same time they constitute a normal *circuit* to the a.c. filament current or component which they are carrying simultaneously. From the filament of tube R,R electrons are emitted, and pass to the plate of that tube.

From the plate, their further course can be traced to the primary of the output transformer, RR-158; from the center tap of that output transformer straight down to the second junction point; thence left through the two choke coils, 0117A and 1505, still left to the center tap of the fourth secondary, thence again proceeding through two parallel paths to the filament of the rectifier tube.

In the circuit as thus traced, one-half of the fifth secondary (either half alternately) is the source of the power, and the upper pushpull tube, R,R is the load upon the circuit. The negative leg of the circuit runs from the center tap of the fifth secondary through the chassis and the top secondary to the filament of pushpull tube. The positive leg runs from either end of the fifth secondary, through either rectifier plate, and thence through the choke coils and the output transformer to the plate of the top tube.

Tracing the same circuit from positive to negative it is only necessary to begin at either end of the fifth secondary and follow to the corresponding rectifier plate, to the rectifier filament, to the fourth secondary center tap, right through the choke coils, up to the output transformer, left through the tube to filament terminals R,R, in at terminals R,R of the top secondary of the power transformer; thence to the center tap of that secondary, right through R-26 to chassis, and (at the very bottom of the drawing) from chassis to the center tap of the fifth secondary which is the negative terminal. The circuit is identical tracing it either way; the electrons, of course, flow from negative to positive.

Other Circuits Traced

There are a number of other plate power circuits, or branches, all of which will now be followed from positive to negative; the reader may wish to trace them back for himself in the reverse direction.

From the center tap of the fourth secondary of the power transformer follow right through the two choke coils and up to the center tap of the primary of transformer RR-158. From the lower terminal

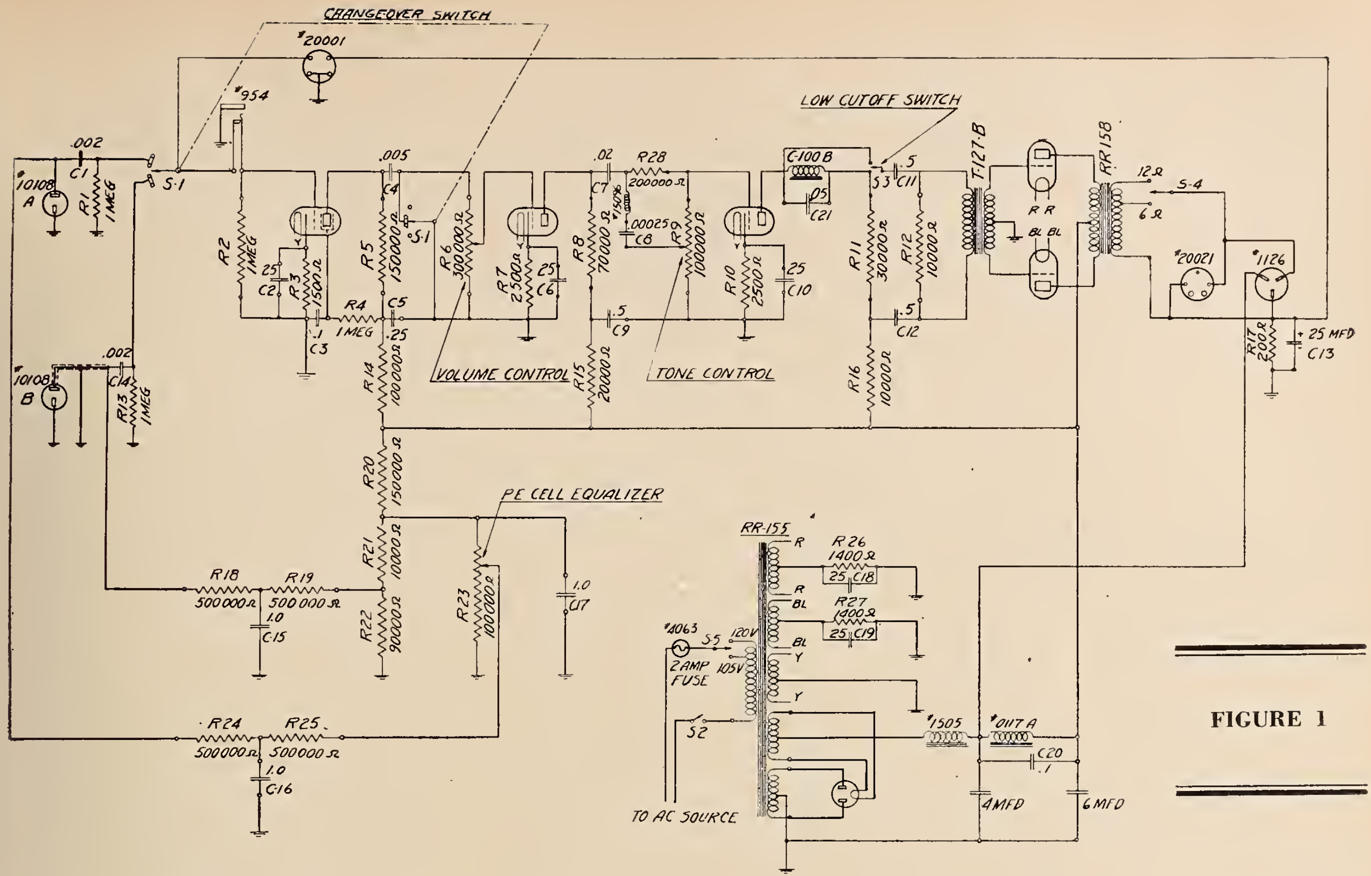

FIGURE 1

of that primary to the plate of the lower pushpull tube, BL, BL. Across the tube to the filament, out at the filament terminals and through the blue wires (omitted in the drawing, of course), to terminals BL, BL of the second secondary of the power transformer. From the center tap of that secondary through R-27 to chassis, which, of course, is the negative terminal of the circuit.

Begin again at the positive terminal and trace right as far as the first choke coil, 1505; then up, right and up to the eleven o'clock terminal of receptacle 1126. Through an external circuit the line continues to a loudspeaker field (or fields) and returns to the six o'clock terminal of the same receptacle; thence down through R-17 to ground or negative.

The voltage drop across R-17 serves as a source of microphone current, and this current is steadied by the filtering action of condenser C-13. From the upper end of R-17 trace right past R-13, and left to receptacle 20001. An adapter, depending on the type of microphone used, may be plugged into the receptacle. Return to ground or negative is completed through the two lower terminals of the receptacle.

Return once again to the positive side of the source, the center tap of the fourth secondary, and trace right through both choke coils and thence up to the first junction point, whence a line runs left that may be considered the positive bus bar for the rest of the plate circuits of this amplifier; in tracing those circuits that line may be considered equivalent to the positive source.

Following right along this bus line the first connection is to R-16, whence the rectified plate supply continues up, through R-11, left through C-100-B, left and down to the plate of the tube; thence to the cathode of the tube and down through grid bias register R-10 to ground or chassis or negative.

Returning to the same bus line, the next connection to the left is seen to be the one to R-15 which can be followed up through R-8, left and down through the tube, down through bias resistor R-7 and to ground.

Still further left along the same bus bar there is a junction point from which one branch can be traced up through R-14 and R-5, left and down to the tube, and to ground through a bias resistor as before.

Between R-14 and R-5 there is a junction; from this trace left through R-4 and up to the screen grid of the tube, across the tube to cathode, and through R-3 to ground.

Photocell Supply Circuits

It is evident that all of these circuits are in parallel to each other, all being connected at one side to the same positive bus, and all connecting at their negative side to chassis.

From the left-hand end of the positive bus trace down through R-20, thence through R-21 and R-22 to ground. Current flows through these two resistors to ground; hence, there is a voltage drop across them. Nine-tenths of that voltage is tapped by the connection running off to the left through R-18 and R-19, and thence up and left through coaxial cable to photocell B. R-18 and R-19, together with C-15, act to reduce hum and to hold down the percentage of photocell speech current that may be wasted in this circuit.

Return to the left-hand end of the positive bus bar, down through R-20 as before, and right and down through R-23. It is evident that R-23 is a voltage divider corresponding exactly and in every detail to the combination, R-21 and R-22, except only that in the case of R-23 the tap connection is variable. Any desired voltage along R-23 can be selected by means of a screwdriver, and the voltage thus obtained may be regarded as a source—trace down, left and up to photocell A. (Omission of coaxial cable in the case of this cell is an error in the drawing.)

Adjustment of the tap connection to R-23 is the means by which the voltage applied to cell A can be made either higher or lower than the unchangeable voltage applied to cell B, thus compensating for inequalities in the volume output of the two cells.

Both photocell supply circuits can be regarded as being wired in parallel to the positive bus line, through their respective voltage dividers; or each voltage divider can be regarded as a source of

voltage with its own positive and negative terminals—the positive lines then running through series resistors and coaxial cable to the anodes of the photocells while the negative legs, of course, trace from cathode through the coaxial shells to chassis.

Additional filtering is connected across the voltage dividers in the form of condenser C-17, drawn just to the right of R-23. The power filter of the entire plate circuit consists of two choke coils, 1505 and 0117-A. together with the 4 mfd and 6 mfd condensers drawn just below them. The microphone supply is filtered by the field winding of the loudspeaker or speakers, and additionally, as already noted, by C-13. C-20, under coil 0117-A, would appear to be a stabilizing condenser introduced as further precaution against possible undesired feedback.

Grid Bias Circuits

As already found in tracing the plate circuits, the plate current of each tube completes its path through resistors wired in series with the tube's cathode—in the case of the pushpull tubes, in series with the center taps of the filament supply windings of the power transformer. The negative side of each bias resistor is connected to ground, and the control grid of each tube is also in some way connected with grid. Thus in every tube the voltage of the control grid is more negative than that existing at cathode, by the extent of the voltage drop through the tube's bias resistor. That voltage drop, of course, corresponds to the amount of plate current flowing through the bias resistor — which is identical with the amount of space current flowing through the tube.

The space current of each tube varies momentarily according to the volume of speech current which the tube is amplifying. To prevent these variations from appearing as momentary changes in grid bias, each bias resistor is by-passed by a condenser that exerts a filtering action.

In the case of the left-hand tube regard C-3 as a source of voltage, the positive side of which is connected to cathode and the negative side, through R-2, to grid. C-2 is the filter condenser.

In the circuit of the next tube C-6 is the by-pass condenser; R-7 is the bias resistor wired positive to cathode and negative (through R-6 and a variable tap connection) to grid.

R-10 is the bias resistor of the next tube, wired negative to grid through R-9, and C-10 is the by-pass condenser.

In the case of the pushpull tubes, R-26 and R-27, as already seen, are the bias resistors. They are connected positive to their respective filaments through their respective filament supply secondaries; while their negative ends are grounded to chassis, and the grids of the pushpull tubes also ground to chassis through the secondary of the coupling transformer.

Speech Circuits

The direct current flowing through the photocells pulsates in strength according to the light and dark areas of the moving sound track. Thus each cell can be regarded as the source of a pulsating voltage or a.c. component. Supposing cell A to be in operation, the circuit connected to that cell can be traced from anode right through C-1, down through R-1 and thence to cathode. A branch circuit can be traced as follows: Positive leg—right through C-1 and the upper terminal of S-1, right through the closed contacts of jack 954, to the control grid of the first tube. Negative leg—from cathode through chassis, up from chassis to the bottom of R-3, left, up through C-2 and right to the cathode of the same tube. The tube's control grid and cathode, regarded together as constituting a condenser, are the load in this circuit.

Switch S-1 is the changeover between cells A and B. An extension of the shaft of this switch appears behind the casing of the amplifier and, of course, revolves through an arc when the switch is thrown from side to side. Projector changeover devices can be attached to this protruding shaft, and in that way visual changeover is effected simultaneously and automatically with the switching of the sound.

Another interesting feature of this amplifier is that S-1 has extra terminals (also designated S-1 and drawn to the right of R-5). While changeover is actually in process these additional terminals momentarily short circuit R-5, cutting off all sound for the fraction of a second involved.

Microphone input is connected directly (through receptacle 20001) to the blade of the sound changeover switch, and therefore can actually be superimposed upon (mixed with) the film sound if desired. Regarding R-17 and the microphone (in series with each other) as the source of pulsating microphone output current, the positive end of that source is wired to the grid of the first tube and the negative side, through the chassis connection at the lower end of R-17, and through C-2, is wired to the tube cathode.

If the microphone and its adapter are of the dynamic type the output will be a.c. and not pulsating d.c. In that case one leg connects to grid through the blade of the changeover switch, and the other leg connects to cathode by virtue of the ground connection at receptacle 20001.

If a phonograph is plugged into jack 954 both the microphone and the photocells are completely disconnected by the opening of the jack's auxiliary contact. One side of the phonograph line connects to grid through the tip of the jack, and the other side connects to chassis through the sleeve of the jack.

The cathode and plate of the first tube may correctly be regarded as the terminals of a source of amplified pulsating current, and the circuit connecting to this source may be traced up and right from plate, down through R-5, right through C-5 to chassis, left through chassis to the lower end of C-2, and so back to cathode. Since this current flows through R-5, that resistor may be regarded as the source of a pulsating voltage drop, and the circuit connected to it can be traced right through C-4, down through R-6, left through C-5. (This source, R-5, can be regarded as the point of origin of all speech current appearing further on in the amplifier, and it is completely short circuited, as explained, during instants of changeover.)

Source of Pulsating Voltage

Since the current just traced completes its path through R-6, that resistor in turn may be regarded as a source of pulsating voltage drop. Any desired portion of that voltage drop is tapped off by the variable connection, which is the volume control. The source of pulsating voltage consisting of that portion of R-6 between the point at which the sliding contact is set and the lower end of R-6 is wired to grid and cathode of the next tube through C-6; the tube's grid and cathode together, considered as a condenser, constituting the load.

The amplifier's speech circuits continue in practically identical manner to the primary winding of the coupling transformer. However, there are two identical devices inserted in those circuits. The tone control consists of resistor R-9, together with R-28, coil 15096 and C-8. Coil 15096 and condenser C-8, in series, constitute a tuned bypass circuit through which some of the speech current output of the second tube is shunted or short circuited, and thus prevented from appearing across the grid and cathode of the third tube for further amplification. The very small capacitance of C-8 indicates that it is principally the higher frequencies that will be short circuited by this device, but the volume or extent of h.f. attenuation will depend on the setting of the slider of R-9. With that slider at the bottom of R-9, h.f. attenuation will be maximum.

In series with the plate circuit of the next tube there is a low frequency attenuator. With switch S-3 set at the bottom terminal the output circuit from the plate of that tube runs through coil C-100-B directly to the coupling condenser C-11 and to the primary of the coupling transformer; but with S-3 set at the upper

(*Continued on page* 30)

Prevention of Projection Room Fires

By *WILLIAM G. NAFASH*

MANY THOUSANDS of words have been written about the prevention of film fires in projection rooms. Numerous "do's" and "don'ts" have been hammered at the projectionist, but the fact remains that we still have our film fires and that possibility always will remain so long as we use nitrate film stock. A large percentage of film fires in recent years have been entire show fires, consuming every foot of film in the projection room right down to the last date snipe. No film fire should ever go beyond the reel which first became ignited.

A fire sometimes results in a hard-to-believe climax, such as the one which occurred recently in a nearby city. Projectionist "R" had just come in to start the night shift. The day man was still in the projection room. Suddenly they both smelled smoke, that film odor which every operator dreads. A sheet of flame shot out of the rewind room. The running projector was stopped, shutters dropped and an attempt was made to get out of the blazing inferno. The day man made it, but Mr. "R" didn't. The only other way of escape was through a window located in the rear of the projection room. Clothes aflame, Mr. "R" hung on the sill until he had to let go. He landed in a concrete alley, three stories below, right in the middle of a pile of rubbish which immediately caught fire. He finally was pulled out and rushed to a hospital suffering from fractures and burns. Although this happened months ago, Mr. "R" still is hospitalized, and is fortunate he did not lose his life.

Why did the entire show catch fire? Was there film laying around in the open, or were the film cabinets defective? Let's analyze a projection room to try and find out the cause of a film fire spreading.

Exhaust Highly Important

Modern projection rooms are designed with emphasis on safety, location, and sufficient room for the various pieces of equipment. Rewinds and film cabinets are well located. Two exits are provided, with neither one through the rewind room if at all possible. Sometimes the location of a projection room does not permit a second door, but any sort of an exit to an adjoining roof or even a window with a short drop, might save a life or prevent serious injury. Sometimes there is a straight ladder leading to an opening in the roof, but this type of exit is almost useless in case of fire, as opening the trap-door would only ventilate the blaze and pull it up through it.

The projection room exhaust is very important. It must have adequate capacity to exhaust any gases or fumes which might be generated. It is claimed that a system which has sufficient capacity to properly ventilate a fire, would be too powerful for normal operation. If a one-speed system is used a happy medium must be reached.

The other method, which has been tried with very good success, is to use a two-speed motor, with the duct work of a capacity to handle the higher speed. A switch is mounted on the front wall and controlled by a trip on the shutter control bar. Under normal operation the motor would run at its slow speed, but if the control bar was tripped for any reason, the switch automatically would go into its high speed position, greatly increasing the cubic feet of air per minute exhausted. This is a good thing to keep in mind, so that when the days of priorities are over, it can be strongly recommended.

The shutter control system must be positive in action. The shutters must drop every time, regardless of whether you use a simple string hook-up or an elaborate control bar system. When was the last time you dropped your shutters? Try them tonight, after the show, of course, and you might get a surprise. Is your spotlight or stereoptican port left open? If so, why? Are your shutter channels twice the height of the portholes? Find out now or you may find yourself in the predicament of the projectionist who, upon rushing over to his master trip and yanking it down, pulled almost all of the shutters out of their channels and found them dangling in midair. Luckily for him the fire was confined to the mechanism interior. Pad the bottom of your channels so that when your shutters do drop they don't sound like a block-buster. Check your fire shutter links. There should be one for each porthole, and at least two on your master cord or chain, one over each projector. Projection room safety links should have a melting point of 160° F.

When a projection room is first built great care is taken to conceal conduit and see that a minimum of flexible cable is used. Rigid inspections are made, and an electrically perfect theatre starts its long grind. Come back to this same theatre a few years later and you are due for a shock. You're liable to find an extension cord running around the room feeding a reading light. Another might wind around to a clock. Others will supply stoves, heaters, or run up to the upper magazine to feed a couple of pilot lights.

Proper Wiring Important

Some of these magazine lights are wired with very thin armored cable containing nothing more than bell wire. Isn't a projection room dangerous enough without throwing in these extra hazards? Pilots will be thrown into motor circuits. If that little 6-watt lamp should short, your show stops. Get rid of those long extensions. Wire an outlet immediately adjoining or behind the clock. Plug in your trouble lamp only when needed. Make your projection electrically right.

How about your film storage cabinets? Do they really seal the reels away from the rest of the show; or do they just put them out of sight? A good many do not close tight. Find out why. Have them repaired or replaced immediately. Do you have enough compartments to take care of the biggest show you might receive? Do you find it necessary to hide one or more reels behind a door or under a table? A flame will find them soon enough. When you get your new show, do you immediately put the reels away, or are they left in the open shipping can until examined or run? I've seen entire shows, totaling over 20,000 feet of film, laid out wide open on the rewind room floor, waiting their turn to be examined and put away, and all the time the picture was on the screen. At night when the show is going back the same thing is done in reverse. As the reels come off the projectors they are thrown into the open shipping can which stays open until the feature is finished. This is done quite often, as in quite a few cases it requires superhuman effort to close or open some of those shipping cases. If you hit one

of those stubborn cases leave your film in the cabinets until the last reel, then put them all away together.

Keep Magazines Closed

Another bad habit is that of running with open magazines. This is nothing more or less than an invitation to a simple aperture fire to come upstairs and visit, and have a roaring good time. Some projection rooms have all their date snipes neatly wound, labeled, and stored away in cubbyholes, but WIDE open. Many times the reel which just came off the machine is put on the rewinder and the next reel to be threaded is taken out of its compartment. There's 4,000 feet of film right there ready for trouble. Add all these things together and you can begin to understand why we have total film fires.

How are your fire extinguishers? Strange as it may seem, some projection rooms have the soda and acid type. Although this is recognized as one of the best ways to put out a film fire, it has no place in the projection room with its countless electrical circuits. The one-quart type, which is usually filled with carbon-tetrachloride, is safe to use on electrical circuits, but when used on intense film fires, generates a form of phosgene gas. This gas may prove fatal if inhaled in a sufficient quantity. The best extinguisher to use is the carbon dioxide type. This blankets the fire with a dry-ice foam, is safe on electrical circuits, and generates no poisonous gases.

So we find that limiting the size of a film fire is not too hard a job, and requires only a few simple precautions.

First—Know your projection room. Figure out beforehand your means of escape from any part of it. Make certain the exhausts are on.

Second—Check and, if necessary, remedy your automatic shutter trip system. Trip the master periodically.

Third—Get rid of all that open wiring. This does not mean necessarily that you must throw out any devices you may have. Have permanent outlets installed wherever you may need them.

Fourth—Check your film storage cabinets. See to it that any film in them is completely isolated from the rest of the projection room. Keep all magazines closed except when threading. Make certain that at no time during the performance is more than one reel exposed other than the one which is being projected. Enclose any open date snipes.

Fifth—Make sure that your extinguishers are loaded. See that the extinguisher leaves its mounting bracket without having to tear the bracket off the wall.

If the above precautions are taken and kept you will know that your projection room is ready for come what may, and there is no reason under the sun why a fire should sweep the whole show and gut the entire projection room. It is sometimes hard to change a routine of many years' standing, but remedying anything which might cause a catastrophe is well worth it. Ask Mr. "R".

Presenting: Wm. H. Hartnett

WILLIAM H. HARTNETT, chief projectionist for the Famous Players Canadian Corporation, disappointed his father because he did not follow his business footsteps, but Bill's son, eleven years of age, currently is looking for a job distributing handbills, or as a prop boy or cleaner, the route that launched Bill into his lifelong work. It's pretty sure to be like-father-like-son in this case.

Bill Hartnett was born in Ottawa, Canada, on Dec. 17, 1895, of Irish-Canadian parents, and despite paternal advice was distributing handbills at the age of 13. In 1911 he was head usher and relief projectionist at the first Keith theatre in Ottawa, and was doubling as stage carpenter, electrician and flyman as the occasion arose. From 1912 to 1914 he worked for the Mark-Brock organization as chief usher and floor manager.

At the inception of the first World War he joined the Canadian Army and upon his discharge in 1915 went back to the projection room, applying for membership in the newly-formed I.A. Local No. 257. He first was elected to office in 1916 and has served as an officer in some capacity for twenty-five terms. At present he is business agent for the local. He also was secretary-treasurer of the Theatrical Federation from 1922 until the group was dissolved in 1932. He has for some time been chief projectionist in this district for the Famous Players Canadian Corp. In 1929 he was honored with a gold membership card in Stagehand Local No. 95.

Bill has represented his local and the Theatrical Federation at many District and I.A. conventions, as well as at the Dominions Trades Congress conventions. Upon the organization of the Dominion Government National Film Board, members of both Local 95 and 257 benefited through his organizing ability. Recently he was consulted regarding post-war plans by the government, and he is a firm believer in the policy of a man for each projector.

Hartnett usually is appointed to act for I.A. in emergencies with the Canadian government, as Ottawa is its capital, the authority being vested by Bill Covert, I.A.'s second vice-president.

A strong believer in self-education Bill had every member subscribe to INTERNATIONAL PROJECTIONIST, and on his resolution a copy of the magazine will be found in every projection room in Ottawa. He has been active in promoting sales of War Savings Stamps and Bonds, and was personally thanked and congratulated for his services in this respect by Canadian Minister of Finance Ilsey at a public rally commemorating his work on behalf of Local 257's efforts to help win the war.

He was married in 1929, and his major hobbies are swimming, bridge and gin rummy. He is a member of the Bayswater Council, Knights of Columbus. He has innumerable friends and admirers who would do anything possible for him.

Bill also is one of those lucky men who has a remarkable memory for faces and names, and you can believe that he never forgets a friend. He's also endowed with a real sense of humor, a quick mind, and is able to think and act fast in emergencies.

This is the eighth in our series of who's who in the projection world. From time to time, I. P. will present to its readers brief word portraits of leading figures in the craft.—ED.

NEW ALTEC AGREEMENTS

The K. Lee Williams Theatres, Inc., Hot Springs, Ark., has signed an agreement with Altec Service Corporation for the furnishing of service, projection room replacement parts and sound repair-replacement parts to their entire circuit of theatres located throughout Arkansas, Oklahoma and Texas.

Altec also signed an agreement with the DeMordaunt and Drennen Circuit for the furnishing service to their theatres in Idaho.

IN THE SPOTLIGHT

By *HARRY SHERMAN*

THIS is a convention year for the I. A. T. S. E., and, according to custom serious thought is now being given to the potential candidates for the various I. A. offices. Plans are being laid for the ousting of the rascally "ins" or for the keeping out of the rascally "outs," depending upon one's viewpoint.

This bi-ennial political contest of ours is a privilege we guard jealously. To us, and by that we mean all members of the I. A., it stands as an ironclad institution for which we would forego most other pleasures, such as driving to the seashore, fishing, hunting, etc. But give up our right to choose our International officers and the excitement that goes with it—the blowing off of steam—the release of bottled up emotions—recriminations—accusations? Never! That would be asking much too much.

Looking ahead we see that the I. A. presidency for the next two years will be heavily burdened. It will not be an easy job for any man, no matter how well fitted he may be for the assignment. Whoever he may be, he will be under close scrutiny by the many enemies of organized labor and we say that if any of our I. A. officers are going to be smeared, let the mud-slinging be done by our enemies from *without* our organization and not from within.

Free speech is one of our most cherished possessions. Delegates to the forthcoming convention should exercise discretion and self-control before sounding off on the usual pre-convention tirades and accusations.

The lot of a union official is not always an easy one. Should he be hard and resolute in his convictions, he is called a dictator. On the other hand, should he be yielding, he is criticized and scorned by the membership for not using the "big stick." At best it is a thankless job, and as an ex-union official, we know whereof we speak when we say that gratitude for services rendered to the rank and file of union membership is a practically unknown quantity.

The more we think of the trials and tribulations that confront the I. A. presidency, the less we can understand why anyone should seek that office. We marvel at the man who has the courage to stand up before the flying brick-bats and announce his willingness to tackle the job. Whoever he may be, let us pray that he will prove himself worthy of the trust placed in him.

● According to the final decision just rendered by the War Labor Board, RKO and Loew's, Inc. must pay their projectionists the tidy sum of approximately $80,000, overtime pay retroactive to September, 1943. The WLB agreed with the officials of Local No. 306, New York City, who brought action against the two aforementioned theatre circuits, that projectionists should be paid for their time from the moment they step into the projection room preparatory to the opening of the show. Heretofore, projectionists were expected to report for work from one-half to one hour before the opening show in order to check on their equipment and make sure that everything was in working order. This extra time was strictly "on the cuff," so to speak, and the circuits did not recognize it as working time.

Our congratulations to President Herman Gelber and to the 306 membership for this victory. To the best of our belief, Local No. 344, Olympia, Wash., set the precedent for a similar successful action against the theatres in its jurisdiction. We hope that many more I. A. locals will follow suit.

● Ralph Ruben, son of the late Max Ruben, and owner of the Amusement Supply Company in Detroit, Mich., expects to join the list of fathers called to the colors. Ralph is the father of two children and is but one of the many I. A. fathers to don the khaki of Uncle Sam.

● We have just been advised by Norman C Waters, business agent of Local No. 554, Lebanon, Penna., that he has successfully negotiated new contracts with the Colonial, Capitol, and Jackson Theatres (Comerford Circuit) calling for weekly increases ranging from $3.75 to $6.50 per man. The new contracts were approved by the WLB as of December 29, 1943, and is retroactive to January 1, 1943. Good work, Walter, we are always happy to print such news.

● A former Altec service inspector, Lou Seibert, is now working as a projectionist at Warner's Stanley Theatre in Baltimore, Md. Lou can relate many an amusing story about his past experiences in the field and one of these days (so he promised) he will send on a few of them for the benefit of our readers. His projection room partner is Sam Isaacson, business agent for Local No. 181—together they make a swell team.

● Martin Villapadierna, member of Local No. 407, San Antonio, Texas and projectionist at the State Theatre there, has been elected an officer of the Lulacs, a Latin-American Society.

● Lynn Goff, member of Local No. 376, Syracuse, N. Y., was tendered a farewell party by the members of his local prior to his induction in the armed forces. Goff is the father of six children, and we believe he holds the record of having the largest family of any I. A. man drafted in the army.

● We are off again on what may seem to be our pet peeve—the laxity of the Iowa state officials with respect to proper building standards and competent supervision of theatres. Evidently the safety of the theatre-going public in Iowa is of little interest to these officials for despite the numerous fires reported in that state, the shocking conditions that instigate these fires are permitted to exist.

A fire recently broke out in the Foxy Theatre in Perry, Iowa, with an estimated damage of $15,000. Fortunately, all patrons were safely led out of the theatre. The projectionist, however (a mere boy of 17) suffered some burns in trying to prevent the blaze from spreading. Also, the Varsity Theatre in Ames, Iowa, reported a fire originating in the projection room which might have had serious consequences had it not been for the alert and quick-thinking projectionist on duty who calmed the audience and averted a panic.

The efforts of men like George Hartnett of Des Moines, and James Marksbury of Sioux City, to have enacted legislation that would eliminate unnecessary fire hazards have to date met with little success. Perhaps these slow-moving state officials need the prodding of another Cocoanut Grove disaster to make them realize the dangers to which they are subjecting the theatre patrons and projectionists in Iowa.

● For the eleventh consecutive year, Ben Hull of Local No. 186, Springfield, Mass., was re-elected president of the Central Labor Union. He also is vice-president of the Massachusetts State Federation of Labor. In recognition of his abilities and services to these organizations, Hull has been re-elected year after year without opposition.

● We sincerely hope that the officers of Local No. 262, Montreal, Canada, are successful in their negotiations to terminate the dual union situation existing in their city. Elsewhere in this issue appears an article pertaining to the absorption by Local No. 306, New York City, of one of the rump unions here. We suggest that Walter Hoffman and Jack Tinkler, of Local 262, contact Herman Gelber, 306 prexy, for some pointers in the matter.

● We think it is high time that some of the so-called patriotic big-shots in our industry were analyzed. Let us start with our labor-baiting friend, Mr. Harry Brandt, head of the Brandt Circuit, who took such an active part in the recent 4th War Loan Drive.

True, Mr. Brandt was a member of the War Activities Committee, organized bond rallying meetings, made touching patriotic speeches, and posed for pictures with movie stars and city officials which later found their way in the exhibitor trade journals. Yes, our good friend got some swell publicity for his patriotic efforts to help our service men.

However, Mr. Brandt overlooked one little matter. There seems to be some sort of an agreement among the exhibitors (not compulsory, but a gentlemen's agreement) whereby admission prices to theatres are reduced for enlisted men. Hence, if the regular admission price to a movie theatre is 55c to the general public, it is reduced to 28c for a man in uniform. With very few exceptions all theatres adhere to that policy. Mr. Ed Sullivan, the noted columnist for the *New York Daily News*, received a complaint from a service man who stated that the Brandt theatres were charging men in uniform the full admission rate. Mr. Sullivan promised to take the matter up with Mr. Brandt.

Oh, yes, the Harry Brandts of our industry are very active in all patriotic and charitable drives. They urge YOU to buy bonds, donate blood, make sacrifices, etc., but their patriotism wanes a bit when it affects their own pockets. The motion picture industry has done a swell job in helping with the war effort and there are many unselfish and sincerely patriotic men connected with it. We are not trying to belittle their splendid work; too much praise cannot be given them, but we do decry these little big-shots who like to hop on the bandwagon of publicity and try to bask in the reflected glory of other people's efforts.

● At the 1917 Cleveland I. A. Convention, Richard (Dick) J. Green was nominated and elected (without opposition) 4th vice-president. He became one of the most popular officers in the I. A. When a change in administration brought William F. Canavan to the presidency, Dick was elected general secretary-treasurer, a post he held with honor and distinction for many years. He resigned from that office at the 1930 Los Angeles Convention.

Mr. and Mrs. "Dick" Green

For a short time thereafter Dick served as I. A. representative and then took up projection work. He is now employed as a projectionist at the Columbia Studios, in Hollywood, as a member of Local No. 165, and from recent reports is enjoying life to the fullest. From the accompanying photograph we see that the years have been kind to Dick—although the sparseness of his hair is a little more noticeable and the waistline is a bit more prominent than of yore.

● **The Thirty-Seventh Convention of the I. A. T. S. E. & M. P. O. U. will assemble in St. Louis, Mo., May 29-June 6. The Convention headquarters will be in the Jefferson Hotel. Further details will appear in our next issue.**

● D. E. Howard, member of Local No. 647, Cheyenne, Wyo., and RCA service

(Continued on page 29)

25-30 Club News

A RESOLUTION was passed at the last meeting of the 25-30 Club opening its membership lists to all projectionists in the United States and Canada who have been members of the I. A. for at least 25 years. Heretofore membership in this Club was restricted to members of Local No. 306, New York City, but so many requests have been received from many parts of the country to make this club a national instead of a local organization that serious consideration had been given the matter for some time, with the result previously mentioned.

The 25-30 Club is a non-political organization, its purpose is the occasional getting together of oldtimers and the helping out of needy members whenever possible. The meetings are usually held the last Friday of each month, and the spirit of good fellowship that prevails is a reflection of the Club's purpose.

Out-of-town members have full membership privileges and are invited to attend the meetings whenever they are in New York. The initiation fee is only $5 and the membership dues are $3 a year. It is not necessary for out-of-town members to present themselves for obligation. Just send in your request for membership together with your check covering the initiation and yearly dues either to this office or to the Club secretary, Morris Klapholz, 125 W. Tremont Ave., Bronx 53, N. Y.

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Wm. F. Canavan, former I. A. president, Thad C. Barrows, president of Local No. 182, Boston, Mass., and Allen Smith, former member of Local No. 249, Dallas, Texas, and at present Chief of the Theatre Division of the War Production Board, have been elected honorary members of the 25-30 Club. Gold cards will be presented to the aforementioned when they are obligated.

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Morris Klapholz and Ben Stern have joined the ranks of fond grandfathers. Plenty of free cigars being passed around these days.

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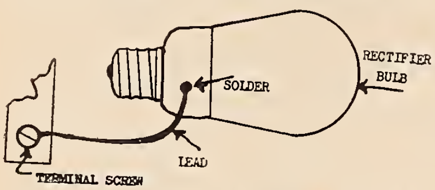
When Lester B. Isaac, supervisor of projection for Loew's, Inc., and an honorary member of the Club, failed to put in an appearance at the testimonial dinner tendered Mike Berkowitz last month, we were a bit puzzled until we found out that he had to supervise an equipment installation in one of the Loew theatres in Pittsburgh. Lester was represented by Milton Berkowitz (son of Mike), chief projectionist at the Capitol Theatre where his father also is employed. Milton proved an able substitute and took great pride in the honors bestowed upon his dad.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Improving Operation of Rectigon Tubes

In power units using the side contact Rectigon tubes there are times when the contact spring makes a poor connection with the tubes. I have eliminated this



source of trouble to a minimum by soldering a wire on the tube base and connecting this wire to a screw terminal. The spring was removed and a screw terminal was used in its place, thus the projectionist is enabled to install these tubes much quicker and with less trouble. (See diagram above.)—C. H. Burns, *RCA.*

Replacing PEC Sockets

When inspecting wiring in soundheads it is sometimes necessary to remove the PEC housing in order to get at the PEC socket so that it may be inspected and cleaned of accumulated dirt and oil. In re-assembling, I have found it very helpful if the photocell is inserted in the socket and the housing slipped over it. The cell can then be used to move the socket around to find its proper place and to hold it there while the screws are tightened.—H. M. Morrow, *RCA.*

Recording Voltage Readings

On installations using tungar rectifier volts, it is a good idea to permanently record the a.c. voltage into the tungar tubes. If the readings on the exciter lamp or fields of the speakers are low, you can readily determine if taps have been changed on transformers. The a.c. voltage from tungar tube plate to ground usually measures 25 a.c. volts with d.c. output of 15 volts.—G. P. Knapp, *RCA.*

Repairing Leaky 712-A W. E. Drives

In many cases leaky W. E. 712-A drives cannot be corrected by merely replacing the porpoise seal. However, in two cases tried, I was able to effect a complete repair by using two seals in the drive. This was done by removing the collar shim and placing a seal at each end of it. This not only effects a seal at both ends but whatever grease may seep past the inner seal is stopped by the regular positioned seal.—E. C. Van Duyne, *RCA.*

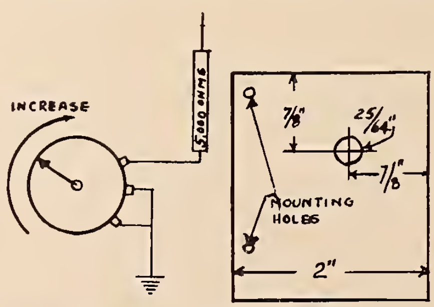
Operation of Emergency Amplifier on Old-Style W. E. System

In setting up an emergency amplifier for use on a Western Electric System of the old type using the W. E. photocells, the adaptor cables were not immediately available. It was found that the W. E. photocells could be removed and the entire 868 socket placed inside the photocell compartment. No additional clamps were necessary since the W. E. photocell clamp and the front part of the compartment held the assembly in place. Sound reproduction and volume were entirely satisfactory.—C. W. Welch, *RCA.*

Improved Method of Balancing Simplex Volume Control Amplifiers

It always has been difficult to balance the pre-amplifiers with the present variable resistor. Of late I have been experiencing some trouble caused by the variation in gain which was traced to the contact resistance varying. To eliminate this trouble and to make adjustments easier, a variable resistor was tried with perfect results.

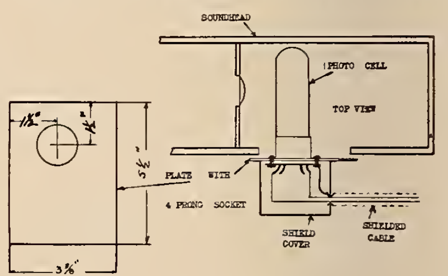
The resistors in the cathode circuit were replaced with a Mallory A-5-MP



Taper No. 4 5000 ohm wire-wound potentiometer. These potentiometers are mounted on small flat plates bolted to holes already in the amplifier base. Both leads are long enough to make connections, as shown in the diagram above.—W. D. Cooley, *RCA.*

Emergency Operation of PS-16 and PS-22 Soundheads

By removing the plate that gives access to the photo electric cell and replacing the photocell into the adaptor socket and substituting the original plate with this arrangement the photocell will be in the same position with respect to the light beam as originally, but in a horizontal position. Socket connections, through



which the photocell is connected, are thoroughly shielded. (Diagram above).—T. M. Campbell, *RCA.*

Increasing Life of Test Film

As with all green film, test films are subject to considerable wear during the initial run due to the slight emulsion deposited on shoes and tracks. Since this deposit may ruin an entire print it is highly desirable to run the test film in such a manner so that contact with any part of the projector mechanism will be avoided.

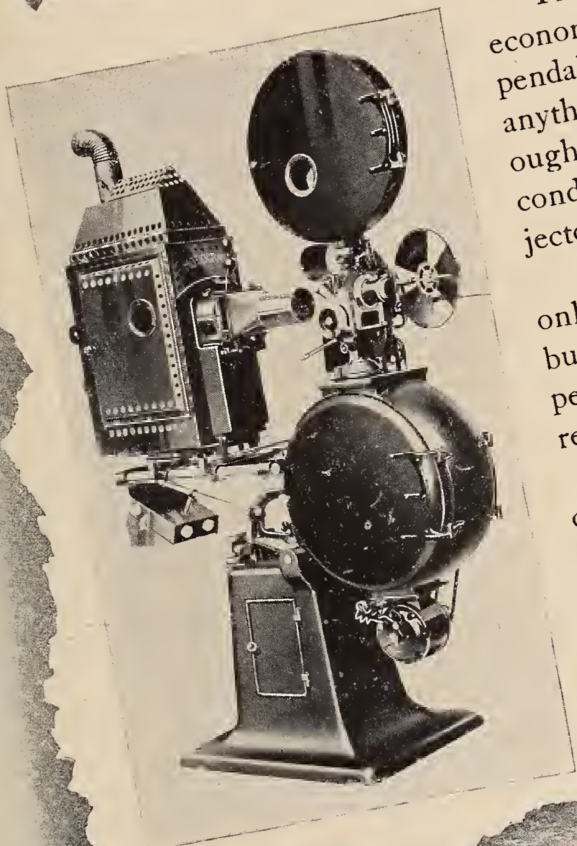
First, the film gate is removed and then the lens holder slide is blocked in a forward position by the insertion of a match stick between the lens holder slide and the guide rod. The film is then threaded without loops in the mechanism, passing from "upper feed" to "lower take-up" sprocket. As the film will now operate without tension or pressure at any point, its life should be materially increased.—F. M. Walls, *RCA.*

Improving Soundhead Motor Operation

Occasionally one will come across a soundhead motor that is noisy on starting. Sometimes this is caused by a worn bearing, but in many cases I have found the trouble to be due to the fact that the bearings are not quite tight in the end

(*Continued on page* 27)

A Motiograph Ad of 1916 said:



The daily delivery of service, easily, economically, uncomplainingly, the dependable readiness to do everything and anything that a motion picture projector ought to do when placed under exacting conditions, is the supreme test of a projector.

And this kind of service is possible only from projectors that are designed and built by builders with many years of experience in the projector industry and vast resources of organization equipment.

Building projectors over 20 years, we claim we have in the Motiograph De Luxe a projector unrivaled in beauty, projection and endurance.

We stand ready, and our distributors everywhere stand ready, to prove our claim for perfect projection, long life and small upkeep.

And you can say that again

in respect to the brand new Motiograph Projector which will be offered as soon as we have won the Victory . . . and you can help hurry that Victory by buying more and more War Bonds NOW!

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TELEVISION TODAY

VI.—Film Projectors for Television

By *JAMES FRANK, JR.*

THE experimental phase of television has already required means for transmitting motion pictures, which means also will be necessary for the future development of television. The problem of transmitting motion pictures by television is somewhat involved for a number of reasons. Television standards today require a speed of 30 pictures per second. The principal reason for this, as explained previously, is to permit a speed that is multiple of the ordinary 60-cycle alternating current power supply.

The 35-mm professional sound motion picture is today photographed and projected at a film speed of 24 pictures or frames per second. Although present requirements make it desirable to process motion pictures especially for television, it has not and is not practical to change all studio camera and sound recording equipment and technique to achieve a greater film speed just for television.

It is, therefore, necessary to reproduce the sound for the sound broadcasting which accompanies the picture at a speed of 24 frames per second in the television projector. The projecting of the picture, however, must simultaneously be transformed into 30 frames per second.

Storage or Non-Storage Pick-up

Another factor which arises is the type of television transmission used — the storage or non-storage type. In the case of the former, a regular intermittent projector; that is, one where the projected light is cut off during the period that the film actualy moves, may be used. The time of cut-off and film motion may be equal to the scanning time.

The mosaic in the iconoscope need only be exposed to the projected picture during the brief time when the beam is returning from the lower right corner to the upper left corner. During the entire time of scanning the picture may be cut off if necessary. Thus, it might be possible to have the picture projected on the mosaic for only 1/600 second and it could be cut off for the rest of the time. Excellent intermittent type projectors in general theatre use require ¼ of the time or 1/96 second to pull down the film. The limit of the rate of pull down is usually the strength of the film material. For the non-storage type of pick-up the picture must be projected upon the photosensitive cathode of the image dissector during the entire scanning period. In this case, only 1/10 of the scanning time or 1/600 second is available for film pull down. This is the flyback interval of the electron stream.

Under these circumstances, an intermittent type of projector cannot be successfully used as no intermittent could pull down the film at this speed without damaging it. A continuous type of projector is, therefore, required for such a television transmitting system.

There are, at the present time, three different types of motion picture projectors for television transmission. Both RCA and GE use an intermittent type projector which is designed for use with the storage type of television transmitting system using the iconoscope. The Farnsworth telecine projector is of the continuous type for use with the non-storage type of transmitting system using the image dissector.

The RCA 16-mm and 35-mm film projectors are shown in Figure 16. The standard motion picture projector pulls down the 35-mm film at a frame frequency of 24 pictures per second. It is necessary for the television projector to operate at this same speed in order that the sound track on the film which originally was recorded at this same speed be properly reproduced for transmission over the television system simultaneously with the picture.

Since the frame frequency of the television system is 30 per second, it is necessary to use a varying frequency of projection so that the average frequency will remain at 24 per second and still satisfy the television requirements. If means are employed to alternate between 30 and 20 frames per second in such a way that the average be 24 frames per second the problem is solved.

Special Type Intermittent

For this reason a special type of intermittent, similar to the Power's type, is used which pulls down two frames for each revolution instead of the conventional one. In doing this, one frame remains in the projection aperture the necessary length of time and the next frame remains in the aperture for a period of fifty per cent longer. To more easily understand this refer to Figure 17.

From this chart it may be seen that the standard motion picture projector brings the picture frame into the aperture and then projects it for ¼ of the time which is 1/96 second or 0.0104 second. Then it is cut off for an equal period but the film does not move. It is again projected for the same period. In the last quarter of the revolution of the intermittent movement the light is both cut off and the film moved so that the next picture frame is brought into the aperture. The time that it takes to project four frames, each twice, is four times 1/24 second, or 1/6 second or 0.1667 second.

Now in the case of the television projector (RCA and GE) five television frames are projected in the same total period. The picture is first projected for 0.0013 second which is less than the flyback interval of the iconoscope which is 0.0017 second. Then it is cut off for

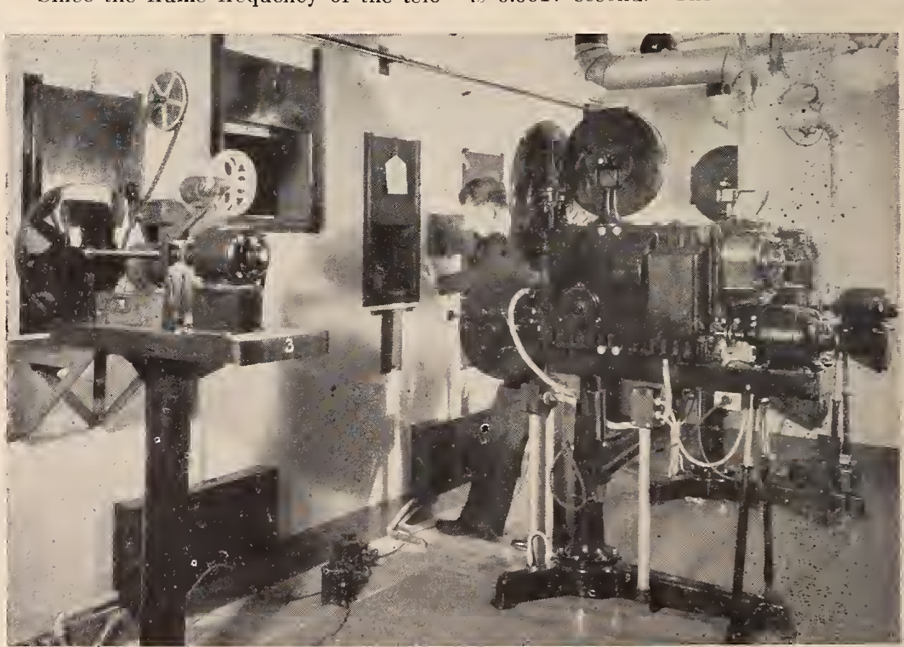

FIGURE 16. *RCA 16-mm and 35-mm film projectors*

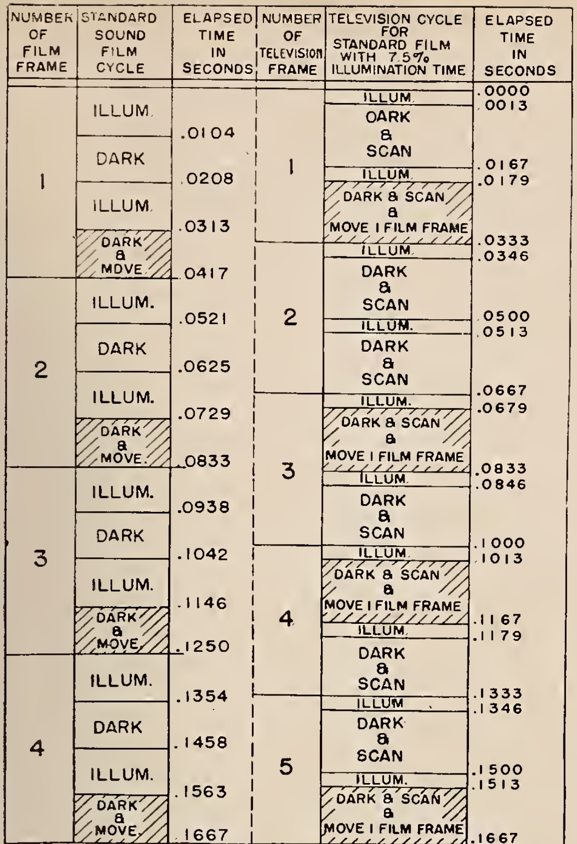

FIGURE 17.

Time cycle comparison for motion picture film in television and theatre projectors

about 1/65 or 0.0154 second. After this it is again projected for 0.0013 second and then cut off and the film pulled down in 0.0154 second. This whole operation takes 1/30 second, and is accomplished in 2/5 revolution of the intermittent movement.

As to the next frame, it is alternately projected and cut off three times with the same periods of duration and it is pulled down in the third cut-off period. All this takes place in 1/20 second or 3/5 revolution of the intermittent movement. The process is then repeated.

This means that with interlaced scanning the first frame is properly scanned twice, first the odd lines and then the even lines. The next frame is scanned three times, first the odd lines, then the even lines and then the odd lines again. On the next frame the even lines are scanned first and then the odd, and so on. Since successive picture frames on the film represent no more of a change in scene or action than live pick-up would for the same time interval this procedure of scanning is perfectly satisfactory. It can be seen from the chart that the time interval for projecting five television frames is the same 1/6 second that it took to project four picture frames.

The type of intermittent movement used in the standard motion picture projector, employing the Geneva motion, uses ¼ or 90 mechanical degrees of the intermittent drive shaft rotation for pulling down the film. In the television projector intermittent movement, this pull-down is accomplished in 1/5 or 72 mechanical degrees of the intermittent drive shaft. Since the television pictures must be scanned at the rate of 60 per second with interlace and with a maximum time interval of eight per cent or 1/12 between them, the motion of the film at the projection aperture must be completed in 66.24 degrees of rotation of the intermittent drive shaft.[1] In the RCA projector a large disk which is made to rotate at 3,600 revolutions per minute is placed in front of the projection lens. In Figure 16 it may be seen on the center projector just in front (to the left) of the upper film magazine. This disk has an aperture in it through which the picture is projected.

Operating at 60 revolutions per second, it permits the first frame to be projected twice for a period of less than 1/600 second or about 0.0013 second each, and the second frame of each pair three times. Thus pictures are projected on the mosaic of the iconoscope every 1/60 second. In this way a film speed of 24 frames per second is converted to one of 30 frames per second. Actually, the standard motion picture projector produces 48 pictures per second, each frame being projected twice. The television projector produces, in fact, 60 pictures per second, each frame being projected at least twice, the even ones three times.

In the RCA television transmitting system, the picture is actually projected through the studio port hole onto an iconoscope camera in the next room which cannot be seen in the photograph. Thus, the picture images are picked up and converted into electrical impulses.

The GE television projector utilizes the same type of intermittent movement as does the RCA, but it is adapted for a more modern type of motion picture projector. See Figures 18 and 19. This projector uses a double shutter attachment similar to that used on the latest type standard motion picture projectors. In this case, however, the cooling fan on

(*Continued on page* 24)

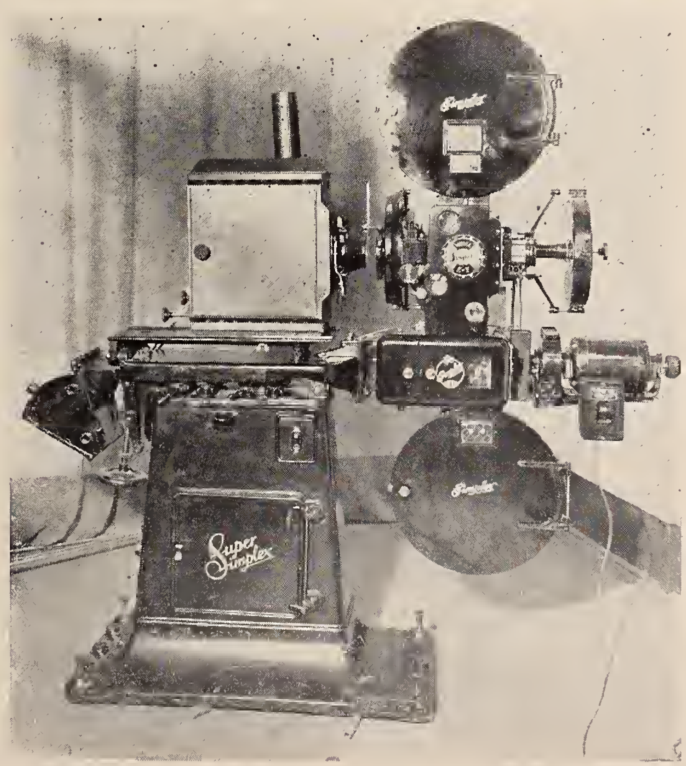

FIGURE 18.

GE television motion picture film projector

PROJECTION AND

35-MM PROJECTION TABLE
Standard aperture: .825" x 0.600"

E.F. in.	40 ft.	50 ft.	60 ft.	70 ft.	80 ft.	90 ft.	100 ft.	110 ft.	120 ft.	130 ft.	140 ft.	150 ft.	160 ft.	170 ft.	180 ft.	190 ft.	200 ft.
2.00"	16.4 11.9	20.5 14.9	24.6 17.9	28.8 20.9	32.9 23.9	37.0 26.9	41.1 29.9	45.3 32.9									
2.25"	14.6 10.6	18.3 13.3	22.0 16.0	25.6 18.6	29.2 21.2	32.9 23.9	36.6 26.6	40.2 29.2	43.9 31.9	47.5 34.6							
2.50"	13.1 9.6	16.4 11.9	19.7 14.4	23.0 16.8	26.3 19.1	29.6 21.5	32.9 23.9	36.2 26.3	39.5 28.7	42.8 31.1	45.6 33.5						
2.75"	12.0 8.7	15.0 10.9	17.9 13.0	20.9 15.2	23.9 17.4	26.9 19.6	29.9 21.8	32.9 23.9	36.0 26.1	39.0 28.3	42.0 30.5	45.0 32.7	48.1 34.9				
3.00"	10.9 8.0	13.7 10.0	16.4 11.9	19.2 14.0	22.0 16.0	24.6 17.9	27.4 20.0	30.2 22.0	32.9 23.9	35.7 25.9	38.4 27.9	41.1 29.9	43.9 31.9	46.7 34.0			
3.25"	10.1 7.3	12.7 9.2	15.2 11.0	17.7 12.8	20.2 14.7	22.8 16.6	25.3 18.4	27.8 20.3	30.4 22.1	32.9 23.9	35.5 25.8	38.0 27.6	40.5 29.5	43.0 31.3	45.6 33.1		
3.50"	9.4 6.8	11.7 8.5	14.1 10.3	16.4 11.9	18.8 13.7	21.1 15.4	23.5 17.1	25.9 18.8	28.3 20.5	30.5 22.2	32.9 23.9	35.2 25.5	37.5 27.3	39.9 29.0	42.3 30.8	44.7 32.5	47.0 34.2
3.75"		10.9 7.9	13.1 9.6	15.3 11.1	17.5 12.8	19.7 14.4	22.0 16.0	24.0 17.6	26.3 19.1	28.6 20.7	30.7 22.3	32.9 23.9	35.2 25.6	37.3 27.2	39.5 28.8	41.7 30.3	43.9 31.9
4.00"		10.2 7.4	12.3 8.9	14.3 10.4	16.4 11.9	18.5 13.4	20.5 14.9	22.6 16.4	24.6 17.9	26.7 19.4	28.8 20.9	30.8 22.4	32.9 23.9	35.0 25.4	37.0 26.9	39.1 28.4	41.1 29.9
4.25"		9.7 7.1	11.7 8.5	13.5 9.8	15.5 11.2	17.4 12.7	19.3 14.0	21.2 15.4	23.2 16.8	25.2 18.3	27.1 19.7	29.1 21.1	30.9 22.5	32.9 23.9	34.9 25.3	36.8 26.8	38.8 28.2
4.50"			10.9 8.0	12.8 9.3	14.6 10.6	16.4 11.9	18.3 13.3	20.1 14.6	22.0 16.0	23.7 17.2	25.6 18.6	27.4 20.0	29.2 21.2	31.0 22.6	32.9 23.9	34.8 25.3	36.6 26.6
4.75"			10.4 7.6	12.2 8.9	13.9 10.1	15.7 11.4	17.3 12.6	19.0 13.0	20.7 15.1	22.5 16.4	24.2 17.6	26.0 18.9	27.6 20.1	29.4 21.4	31.1 22.6	32.9 23.9	34.7 25.2
5.00"				11.6 8.4	13.1 9.6	14.9 10.8	16.4 11.9	18.1 13.2	19.7 14.4	21.4 15.6	23.0 16.8	24.6 17.9	26.3 19.1	27.9 20.3	29.6 21.5	31.3 22.8	32.9 23.9
5.25"				10.9 7.9	12.5 9.1	14.1 10.3	15.7 11.4	17.2 12.5	18.8 13.7	20.3 14.8	21.8 15.9	23.5 17.1	25.1 18.3	26.7 19.4	28.3 20.5	29.8 21.7	31.3 22.8
5.50"				10.5 7.6	12.0 8.7	13.5 9.8	15.0 10.9	16.4 11.9	17.9 13.0	19.4 14.1	20.9 15.2	22.4 16.3	23.9 17.4	25.4 18.5	26.9 19.6	28.4 20.6	29.9 21.8
5.75"					11.3 8.3	12.8 9.3	14.2 10.3	15.7 11.4	17.1 12.4	18.6 13.5	20.0 14.5	21.4 15.6	22.9 16.6	24.3 17.7	25.8 18.7	27.2 19.8	28.6 20.8
6.00"					10.9 8.0	12.3 8.9	13.7 10.0	15.1 10.9	16.4 11.9	17.8 13.0	19.2 14.0	20.5 14.9	22.0 16.0	23.3 17.0	24.6 17.9	26.0 18.9	27.4 20.0
6.25"					10.5 7.7	11.9 8.6	13.1 9.5	14.3 10.4	15.9 11.4	17.0 12.4	18.4 13.3	19.7 14.3	21.0 15.3	22.3 16.2	23.6 17.2	25.0 18.1	26.3 19.1
6.50"						11.4 8.3	12.7 9.2	13.9 10.1	15.2 11.0	16.4 11.9	17.7 12.8	18.9 13.7	20.2 14.7	21.5 15.6	22.8 16.6	24.0 17.5	25.3 18.4
6.75"						10.9 7.9	12.2 8.8	13.4 9.8	14.6 10.6	15.9 11.6	17.0 12.4	18.3 13.3	19.5 14.2	20.7 15.1	22.0 16.0	23.2 16.9	24.4 17.8
7.00"						10.5 7.6	11.7 8.5	12.9 9.4	14.1 10.3	15.3 11.1	16.4 11.9	17.5 12.8	18.8 13.7	19.9 14.5	21.1 15.4	22.3 16.2	23.5 17.1
7.50"							10.9 7.9	12.0 8.7	13.1 9.6	14.2 10.3	15.3 11.1	16.4 11.9	17.5 12.8	18.7 13.6	19.7 14.4	20.8 15.2	22.0 16.0
8.00"							10.2 7.4	11.2 8.2	12.3 8.9	13.3 9.7	14.3 10.4	15.4 11.2	16.4 11.9	17.4 12.7	18.5 13.4	19.5 14.2	20.5 14.9
8.50"								10.6 7.6	11.7 8.5	12.6 9.1	13.5 9.8	14.5 10.5	15.5 11.2	16.4 11.9	17.4 12.7	18.4 13.4	19.3 14.0
9.00"									11.0 8.0	11.8 8.6	12.8 9.3	13.7 10.0	14.6 10.6	15.5 11.3	16.4 11.9	17.3 12.6	18.3 13.3
E.F. in.	40 ft.	50 ft.	60 ft.	70 ft.	80 ft.	90 ft.	100 ft.	110 ft.	120 ft.	130 ft.	140 ft.	150 ft.	160 ft.	170 ft.	180 ft.	190 ft.	200 ft.

SIZES GIVEN ARE TO THE NEAREST TENTH OF A FOOT

Prepared especially for INTERNATIONAL PROJECTIONIST *by Bausch & Lomb Optical Co., and first appeared on p. 16 of the May* 1935 *issue.*

LENS TABLES

The charts here shown are the three tables most needed for projection room lens requirements. Figure 1 is a regular 35-mm lens chart, giving proper focal lengths for a given distance of projection and a certain screen area. Figures 2 and 3 are a little different from ordinary tables and were compiled by Samuel Glauber, member of Local No. 306 and a projectionist at the New York Paramount Theatre.

Figure 2 shows a stereopticon lens table for the standard 3.25″ x 4″ slide. When figuring stereopticon lens size it has been common practice to figure on the basis of the opening on the slide holder itself. When the slide was projected it usually was found that the mat on the slide cut down considerably the size of the image on the screen. Therefore, in compiling this chart Glauber figured the lens size on the basis of the actual mat opening of the slide, which is 2.16″ x 2.88″. An image properly filling the screen is the result.

Figure 3 is a lens equivalent table which has long been needed. This chart shows at a glance the proper size stereopticon lens to use with a given projection lens focal length.

STEREOPTICON PROJECTION TABLE

3¼″ x 4″ slide
(Mat Opening: 2.16″ x 2.88″)

E. F. INCHES	40'	50'	60'	70'	80'	90'	100'	110'	120'	130'	140'	150'	160'	170'	180'	190'	200'
10"	11.5 8.6	14.4 10.8	17.3 13.0	20.2 15.1	23.0 17.3	25.9 19.4	28.8 21.6	31.7 23.8	34.6 25.9	37.4 28.1	40.3 30.2	43.2 32.4	46.1 34.6	49.0 36.7	51.8 38.9	54.7 41.0	57.6 43.2
12"	9.6 7.2	12.0 9.0	14.4 10.8	16.8 12.6	19.2 14.4	21.6 16.2	24.0 18.0	26.4 19.8	28.8 21.6	31.2 23.4	33.6 25.2	36.0 27.0	38.4 28.8	40.8 30.6	43.2 32.4	45.6 34.2	48.0 36.0
14"	8.2 6.1	10.3 7.7	12.3 9.2	14.4 10.8	16.5 12.3	18.5 13.9	20.6 15.4	22.6 17.0	24.6 18.4	26.7 20.0	28.8 21.6	30.8 23.1	32.9 24.7	35.0 26.2	37.0 27.8	39.1 29.3	41.1 30.8
16"	7.2 5.4	9.0 6.8	10.8 8.1	12.6 9.5	14.4 10.8	16.2 12.1	18.0 13.5	19.8 14.8	21.6 16.2	23.4 17.6	25.2 18.9	27.0 20.2	28.8 21.6	30.6 23.0	32.4 24.3	34.2 25.7	36.0 27.0
18"	6.4 4.8	8.0 6.0	9.6 7.2	11.2 8.4	12.8 9.6	14.4 10.8	16.0 12.0	17.6 13.2	19.2 14.4	20.8 15.6	22.4 16.8	24.0 18.0	25.6 19.2	27.2 20.4	28.8 21.6	30.4 22.8	32.0 24.0
20"	5.8 4.3	7.2 5.4	8.6 6.4	10.1 7.6	11.5 8.6	13.0 9.7	14.4 10.8	15.8 11.9	17.3 13.0	18.7 14.0	20.2 15.1	21.6 16.2	23.1 17.3	24.5 18.4	25.9 19.5	27.4 20.5	28.8 21.6
22"	5.2 3.9	6.5 4.9	7.8 5.9	9.2 6.9	10.4 7.8	11.8 8.8	13.1 9.8	14.4 10.8	15.7 11.8	17.0 12.8	18.3 13.8	19.6 14.7	21.0 15.7	22.3 16.7	23.6 17.7	24.9 18.6	26.2 19.6
24"	4.8 3.6	6.0 4.5	7.2 5.4	8.4 6.3	9.6 7.2	10.8 8.1	12.0 9.0	13.2 9.9	14.4 10.8	15.6 11.7	16.8 12.6	18.0 13.5	19.2 14.4	20.4 15.3	21.6 16.2	22.8 17.1	24.0 18.0
26"	4.4 3.3	5.5 4.2	6.6 5.0	7.7 5.8	8.9 6.6	10.0 7.5	11.1 8.3	12.2 9.1	13.3 10.0	14.4 10.8	15.5 11.6	16.6 12.5	17.7 13.3	18.8 14.1	19.9 14.9	21.0 15.8	22.2 16.6
28"	4.1 3.1	5.2 3.9	6.2 4.6	7.2 5.4	8.3 6.2	9.3 7.0	10.3 7.7	11.3 8.5	12.3 9.2	13.4 10.0	14.4 10.8	15.4 11.6	16.5 12.4	17.5 13.1	18.5 13.9	19.6 14.7	20.6 15.4
30"	3.8 2.9	4.8 3.6	5.8 4.3	6.7 5.0	7.7 5.8	8.6 6.5	9.6 7.2	10.6 7.9	11.5 8.6	12.5 9.4	13.4 10.1	14.4 10.8	15.4 11.5	16.3 12.2	17.3 13.0	18.2 13.7	19.2 14.4
32"	3.6 2.7	4.5 3.4	5.4 4.1	6.3 4.8	7.2 5.4	8.1 6.1	9.0 6.8	9.9 7.4	10.8 8.1	11.7 8.8	12.6 9.5	13.5 10.1	14.4 10.8	15.3 11.5	16.2 12.2	17.1 12.9	18.0 13.5
34"	3.4 2.5	4.2 3.1	5.1 3.8	5.9 4.5	6.8 5.1	7.6 5.7	8.5 6.4	9.3 7.0	10.2 7.6	11.0 8.3	11.9 8.9	12.7 9.5	13.6 10.2	14.4 10.8	15.2 11.4	16.1 12.1	16.9 12.7
36"	3.2 2.4	4.0 3.0	4.8 3.6	5.6 4.2	6.4 4.8	7.2 5.4	8.0 6.0	8.8 6.6	9.6 7.2	10.4 7.8	11.2 8.4	12.0 9.0	12.8 9.6	13.6 10.2	14.4 10.8	15.3 11.4	16.0 12.0

SOUND FILM AND STEREOPTICON PROJECTOR LENS EQUIVALENTS

(35-mm) Sound Film Projection Lens E.F.	(3¼ x 4) Stereopticon Lens E.F. to match
2.0"	7"
2.3"	8"
2.6"	9"
2.9"	10"
3.1"	11"
3.4"	12"
3.7"	13"
4.0"	14"
4.3"	15"
4.6"	16"
4.9"	17"
5.2"	18"
5.5"	19"
5.7"	20"
6.0"	21"
6.3"	22"
6.9"	24"
7.4"	26"
8.0"	28"
8.6"	30"
9.2"	32"
9.8"	34"
10.0"	35"

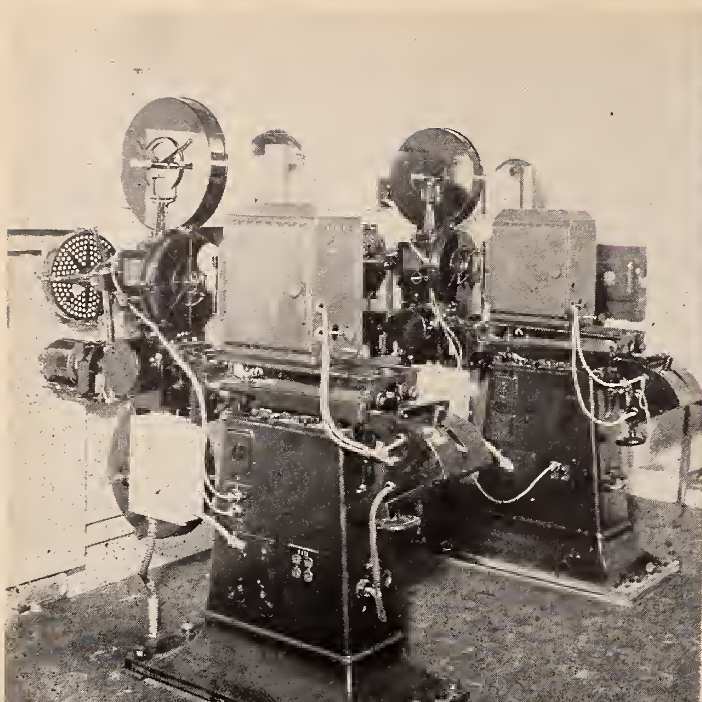

FIGURE 19. *Film projection room in GE television studio WRGB*

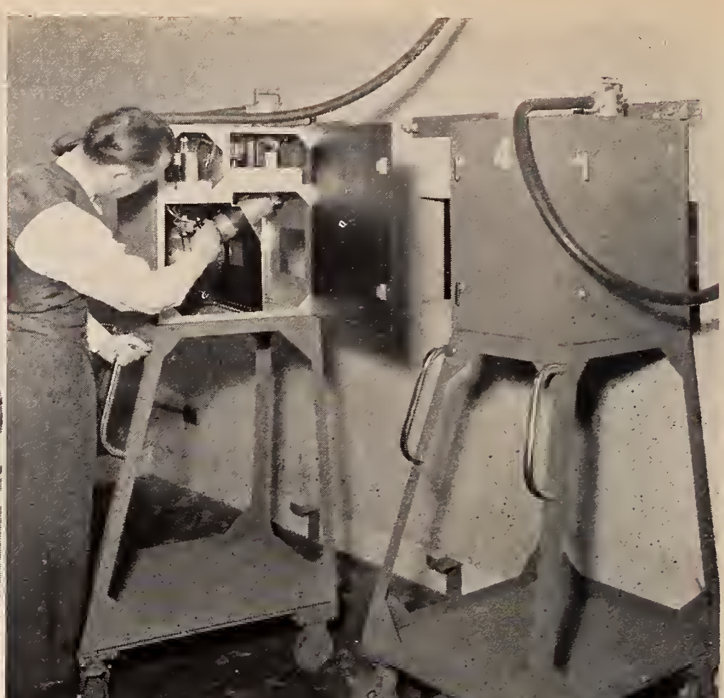

FIGURE 21. *Television film camera in GE television studio WRGB*

TELEVISION TODAY

(*Continued from page* 21)

the rear shutter is omitted, a shutter aperture or opening of seven per cent is used, and the shutters rotate at a speed of 3,600 revolutions per minute instead of the conventional 1,440 revolutions per minute.

Since these shutters are much smaller and lighter than the type of scanning disk used on the RCA projector, there are less mechanical problems. The shutters are designed to operate directly from the motor gear box rather than through the projector drive mechanism, as is done on standard projectors, thereby eliminating many problems inherent with such high speeds. This drive arrangement is shown in Figure 20.

These shutters rotate so that they interrupt the projected light beam and permit the passage of light and projection of the picture for about 7 per cent of 1/60 second, or 0.0012 second, 60 times per second. This time interval is a little less than the flyback interval (0.0017 second) to overcome any mechanical trouble due to back-lash or transients which might exist in any other part of the system.

The GE television film projector also projects the picture through the port onto a television camera in the next room (Figure 21).

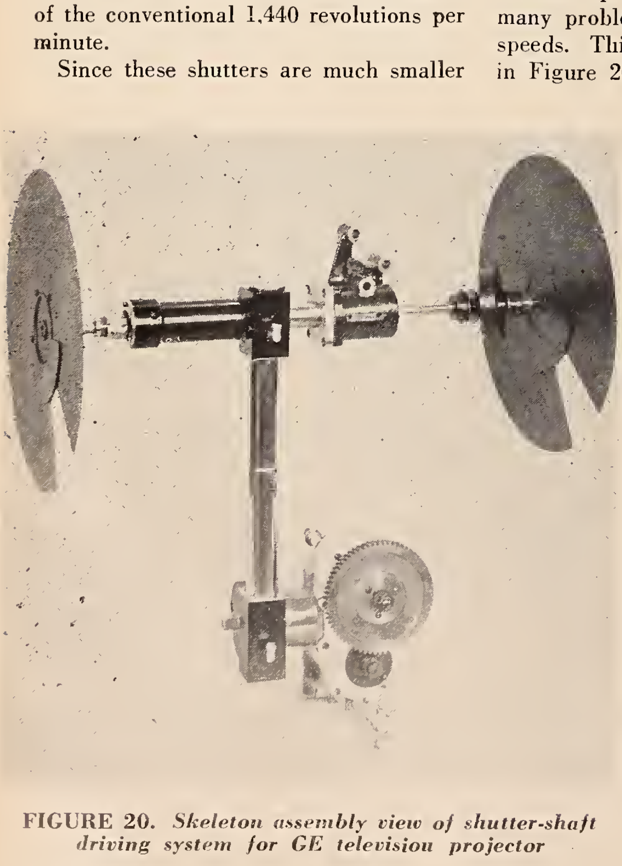

FIGURE 20. *Skeleton assembly view of shutter-shaft driving system for GE television projector*

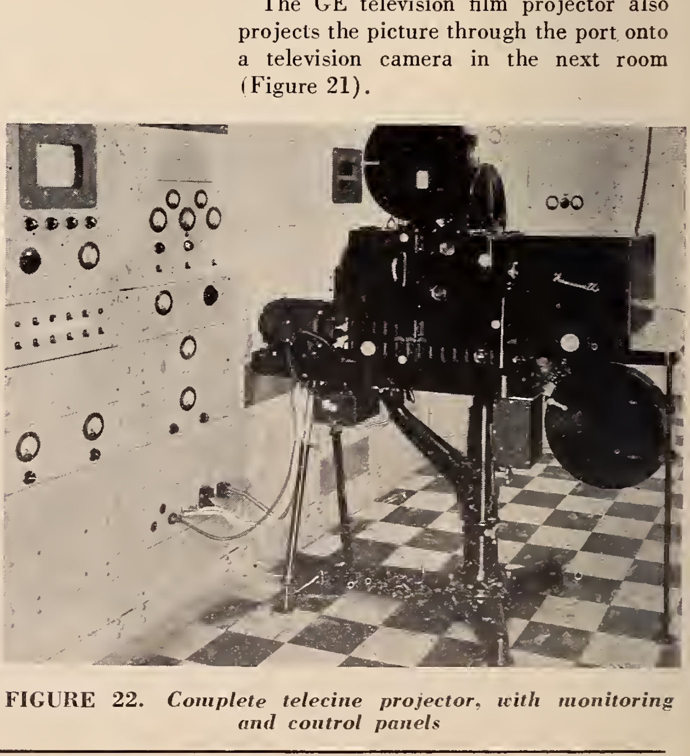

FIGURE 22. *Complete telecine projector, with monitoring and control panels*

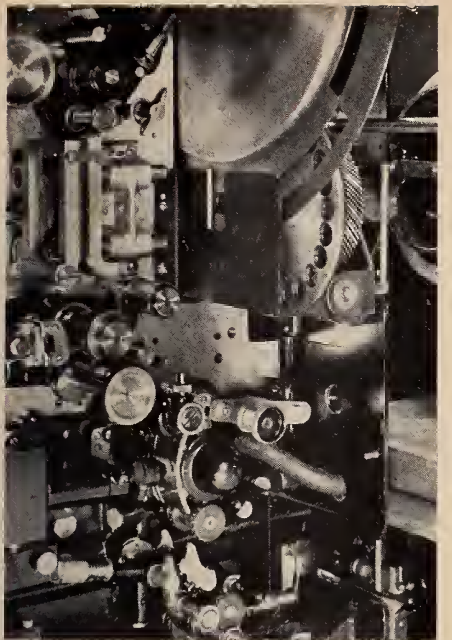

FIGURE 23. *Operating side of projector, showing lens and shutter at interval of projection*

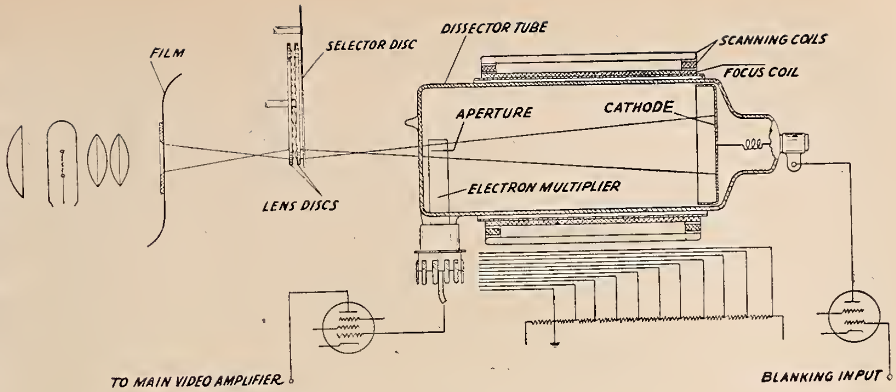

FIGURE 25. *Complete optical system*

Farnsworth uses a motion picture projector of the continuous type, Figure 22, for its non-storage type transmitting system. The image dissector which converts the light images into electrical impulses is incorporated into a camera which is an integral part of the picture head. The camera houses the dissector with its focusing and scanning coils, as well as amplifiers, *etc.* The dissector can be removed without disturbing the other parts. The film moves past the projection aperture at a continuous rate of 24 frames per second. Each frame is made effectively stationary during the scansion period in the image dissector by means of the compensating optical system.

The projector is designed to obtain the required 60 scansion periods per second in the dissector from the film moving at the rate of 24 frames per second, in order to provide proper reproduction of the sound.

The problem in designing such a projector was to project from a film, which is moving at a uniform rate of 24 frames per second, a cathode image which is effectively stationary during the 1/60 second scansions, less a 1/600 second flyback period. It was solved by using the motion of a lens to compensate for the motion of the film and by using a moving slot to open and close the lens so that, for any set of two adjacent film-frames, one frame is scanned three times and the other is scanned twice. Each scansion period is about 1/6 second in length.

The compensating lens motion is provided by a series of spherical lenses equally spaced around the circumference of two discs which rotate in opposite directions at 60 revolutions per minute. The two discs overlap, or are in so-called optical mesh, so that a lens on one disc rides behind a lens on the other disc, thus forming a complete projection lens during the period of projection. The lenses are designed to produce a 3 x 4 inch image which is magnified to any desired degree by an auxiliary lens which focuses the image on the photosensitive cathode of the dissector tube.

A third disc is mounted in front of the two lens discs, seen in Figure 23, which rotates at 720 revolutions per second. Five spiral slots are cut in this disc, as shown in Figure 24, so that a slot follows a selected lens during its rotation, and, for its projection interval, eclipses or cuts off the other 23 lenses. The two lens discs rotate so that the particular lens system selected for projection moves in the same direction as does the film and so two lenses are employed for five 1/60 second field scansions.

From Figure 24 it can be seen that the slots are so spiraled that for one-half of a revolution a lens on each optical compensator, which overlap, permit the projection of the picture for three scansion periods and then during the other half of a revolution another pair of overlapping lenses permit the projection of the picture for two scansion periods. It will also be noted that the spacing between the spiral slots is such as to cut off the projected light for a time interval equivalent to the flyback period.

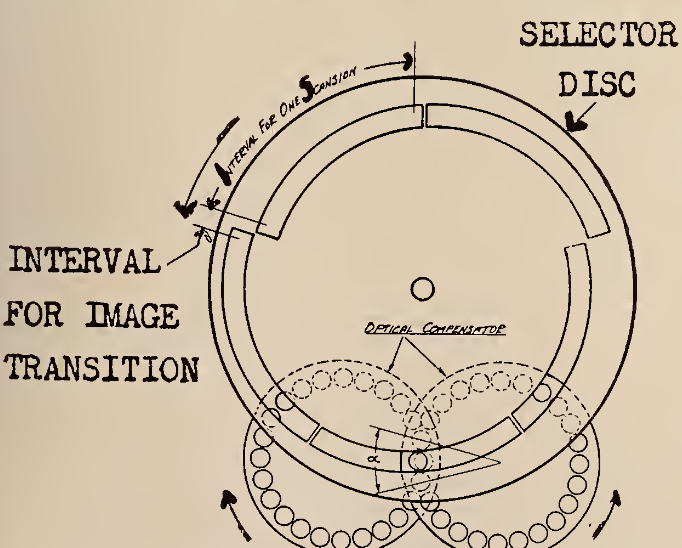

FIGURE 24. *System of selector and lens discs*

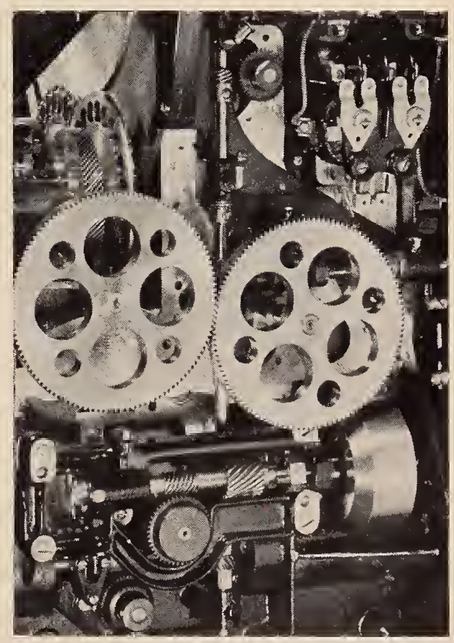

FIGURE 26. *Non-operating side of projector, showing part of special gear train for driving lens discs*

The lens discs are geared directly to the film-drive sprocket shaft. The requisite accuracy in gear-drive has been made possible by recent improvements in gear-cutting and error-measuring methods. The film is illuminated by a special Mazda lamp whose image is projected in the plane of the discs by means of a condenser lens. The complete optical system, excepting the auxiliary lens, is diagrammatically illustrated in Figure 25. A close-up of the non-operating side of the projector showing part of the special gear train required for driving the optical compensator is shown in Figure 26.

The film gate accommodates two interchangeable picture apertures, one for projection to an image dissector tube and the other for projection to a storage type of tube or for visual checking. The former has a height of 1.4 film frames and the latter of 2.2. The smaller aperture reduces the amount of light incident upon the film at the gate and masks a large portion of the upper and lower extraneous optical images whose reflections from the sidewalls to the cathode of the dissector might cause flicker in the picture signal.

The general design of the projector is seen in Figure 27.

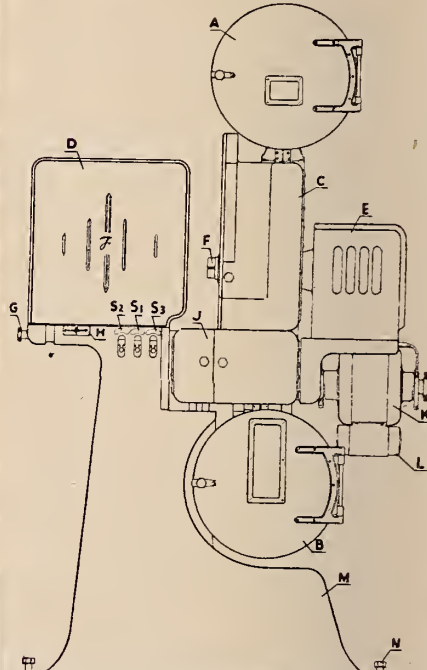

FIGURE 27

[1] The intermittent movement on the standard projector makes 1,440 revolutions per minute while that on the television projector makes 720 revolutions per minute.

Cuts for Figures 17, 18, 19, 20 and 21 were loaned to I. P. through the courtesy of the Journal of the Society of Motion Picture Engineers.

AT YOUR SERVICE

(*Continued from page* 18)

bell, or in the motor shaft. This trouble may be eliminated by prick marking the shaft or inside bore of the end bell, as the case may be, with a center punch. Do this at about four evenly spaced points around the circumference and then reassemble. This usually insures a much quieter start.—A. H. CLOW, *RCA*.

Adjusting Push-Pull Soundhead

As a means of assisting in making prism assembly adjustments on MI-1070 and similar type push-pull soundheads, I have a small one-inch square piece of frosted glass which I fasten to the front of the prism with a rubber band. The glass fits tight against the prism thereby freeing both my hands and permitting me to make the necessary adjustments.—NELSON SPOCK, *RCA*.

Protecting Meter Cases

I installed metal angles on the corners of my test instrument cases so as to protect them from wear in handling, etc.—G. REIGER, *RCA*.

Cleaning Noisy Volume Controls

I recently purchased a bottle of "Carbon X" from the local radio wholesaler which I have been using with extraordinary success on noisy volume controls. With this accessory there should be no need to replace any of the volume controls, the only precaution to take is to apply it sparingly as too much will change the total resistance of the volume control. However, the excess may be rubbed off with a cloth until the resistance is raised to its original value.—C. M. WYLIE, *RCA*.

Proper Lubricating Oil Essential

I have discovered that improper viscosity of oil is being used in soundheads and projectors, particularly in theatres not having regular sound service. In following up on cases of too quick starting, investigation showed that while all of the starting resistors were in the circuit, the start was still too fast. In many cases it was found that ordinary projector oil was used in the gear case.

In one theatre I found the projectors very sluggish in starting and in this case the resistors were nearly all out of the circuit. Further investigation proved that soundhead oil was being used in the gear case as well as on the projector mechanism. For proper operation, the correct oil should be used on each piece of equipment.—R. SHEPARD, *RCA*.

Replacing Exciter Lamps

If pressure is applied to the bottom of the socket where the wire enters when extracting or replacing pre-focused exciter lamp, the operation will be much easier and the danger of lamp breakage will be minimized.—O. ZWEIGER, *RCA*.

Repairing Soundhead Terminal Boards

Terminal boards used on the PS-22 soundheads on which the corners were cracked near the terminal posts may be repaired in the following manner: Ream out the two corner mounting screw holes in the board to fit the terminal posts. Mount the terminal posts in place. Connect the leads to the posts. Place a piece ot crayon in the center mounting screw hole in the soundhead. Mount the board in place and with washers on the two

mounting screws, tighten them up. Focus lamp and then remove the board. The crayon will have marked on the board the spot for the center hole. Drill out this new hole and replace the terminal board in position. The board is now as good as new.—G. REIGER, *RCA.*

Money Collector

Recently I was in a theatre at a time when a collection for the infantile paralysis fund was taken up, and when counting the "take" difficulty was experienced in separating the dimes from the new pennies. As these new pennies are partly steel, I tried picking them out of the collection with a magnet. This worked fairly well but was too slow until I made a magnet that would work on 110 volts. With this new magnet the pennies were separated from the rest of the collection in two sweeps.—J. M. ESBENSHADE, *RCA.*

Checking Fuse Holders

I have found it to be a good policy to check all fuse holders that have very loose fuse clip mounting in order to eliminate the danger of their becoming loose. I sweat them to the face of the holder and make certain that the fuse is free enough to turn in the clip when it is replaced. This check-up will prevent lengthy sound outages that occur with blown fuses.—W. H. REASIN, *RCA.*

I. A. Elections

L. U. 150, LOS ANGELES, CALIF.

President, E. W. Larsson; *vice-president,* W. G. Crowley; *secretary-treasurer,* M. J. Sands; *business agent,* G. J. Schaffer; *assistant business agent,* T. W. Armentrout; *sergeant-at-arms,* H. J. Kearney, and *guide,* P. Neuerburg. *Executive board members,* C. A. Vencill, R. L. Haskell, J. Maynard, M. Nielsen and J. R. Pylet. T. H. Eckerson, H. C. Smith and H. E. Greiner were elected *trustees,* and L. A. Moelle, A. B. Cameron, and M. Levey were elected *members of the examining board.*

L. U. 222, SHREVEPORT, LA.

President, H. Eaton; *vice-president,* Alon Boyd; *secretary-treasurer,* Frank Gwin; *business agent,* N. S. Laird; *sergeant-at-arms,* G. W. Leopard; *delegate to I. A. Convention,* N. S. Laird. All elected officers comprise the *executive board.*

ARMED FORCES' TALKIES AIDED BY NEW TECHNIQUE

RCA engineers have found that direct recording of the sound track from 35-mm entertainment films to a special 16-mm negative is the most efficient method of transferring sound for 16-mm prints for the armed formes. W. V. Wolfe, manager of recording equipment sales at RCA's Hollywood plant, made this statement in presenting a paper on the subject before a meeting of the Pacific Coast Section of SMPE in Hollywood recently.

As the 16-mm pictures are reproduced with portable or semi-portable equipment under conditions which vary from small halls to outdoor settings it is necessary, in order to meet these conditions to provide a reduced volume range and a modified frequency characteristic. It is no longer feasible to strive for dramatic expression, he said, "since we must be content with providing the maximum intelligibility possible under adverse conditions."

DE FOREST LOOKS FOR EARLY POST-WAR TELEVISION

Dr. William C. DeForest, who thirty-eight years ago invented the audion tube, from which have developed radio, radar and other electronic devices, on a recent trip stopped in Chicago to exchange greetings with William C. DeVry, president of the DeVry Corporation; E. B. DeVry, president of De Forest's Training, Inc., and W. N. Littlewood, chief of DeForest's educational staff.

DeForest's Training was founded in collaboration with the late Dr. Herman A. DeVry to teach radio by means of motion pictures. Advanced electronics devices used in teaching radio, communications and electronics by the school which bears his name were given lengthy consideration, as was the subject of television, which Dr. DeForest says is an earlier post-war possibility for the nation's motion picture theatres than is generally realized.

Projectionists, he feels, need to acquaint themselves with television techniques—and theatre operators keep closely informed on television developments. One of Dr. De Forest's patents was for a motion picture projector sound head vital to modern movies—an invention which brought him the "father of radio and television", and Dr. DeVry, the "father of visual education", together in the early days of both radio and motion pictures.

IN THE SPOTLIGHT

(*Continued from page* 17)

engineer for the last thirteen years in the Shreveport, La., territory, has been transferred to the company plant at Camden, N. J. Ray Stempert, member of the Shreveport local has taken over Howard's duties as service engineer.

● John Asher and Leonard Wood, members of Local No. 165, Hollywood, Calif., are now attached to the Signal Corps at Camp Crowder, Mo. Our very good friend, Lt. Merle Chamberlin, member of 165 and former chief projectionist at the M-G-M studios in Culver City, is also stationed at Crowder. One more local member and they will be able to form their own barber-shop quartet.

● Many thanks to the officers and members of Local No. 511, Jacksonville, Fla., and especially to John N. Spearing for that splendid letter sent to us in appreciation for the assistance we rendered them in their fight to obtain salary increases for the Florida I. A. locals. The increases granted last December by the Regional War Labor Board averaged 5%, retroactive to March 15, 1943. In some cases, depending upon the hourly wage and number of operating hours of each theatre, the increases were even higher.

I. P. is ready and willing to be of service to I. A. locals whenever possible.

● One of our readers, Pvt. Allan V. Hughes, an army projectionist stationed at Ft. Benning, Ga., sent us the following letter in response to our request for information on the operation of army motion picture theatres. Pvt. Hughes writes for both himself and his buddy, Sgt. Walter E. Erdman:

Dear Mr. Sherman:

This will acknowledge receipt of your letter in which you ask for details regarding the work of an army projectionist. I shall try to tell you just how a G.I. projectionist and theatre operate.

Ft. Benning is divided in five areas—Main Post, Sand Hill, Harmony Church, Alabama, and Lawson Field. Sgt. Erdman and I are the chief projectionists at the theatres in the Sand Hill area.

Our films are received from the Atlanta exchanges and they are sent first to the main theatre and later to the remaining theatres. A report must be made of the condition of each print immediately it is received, even to the slightest scratch. Our days are pretty full; new shows are put on at least four times a week. We run training films during the day, and when we do get a break between the training films and the regular show, we spend the time cleaning and keeping our equipment in running order. Our equipment is of the latest type—Simplex E-7 projectors with RCA soundheads, and Peerless model F lamps. Since the army motion picture service prohibits the use of electric rewinds, our rewinds are hand-operated.

In addition to our regular army pay, we get $1.75 per day with an extra 75c for the Sunday afternoon performance.

Sgt. Erdman and I got our training at Camp Polk, La. From there we were sent to California, in the middle of the Mojave desert, and then transferred to Ft. Benning, our present station.

During our travels we visited many projection rooms and found the projectionists to be a swell bunch of fellows. Here in Columbus, Ga., E. L. Gullat, secretary of Local No. 568, is a very good friend of ours. When I was home on furlough, Roy Ruben of Local 199, Detroit, Mich. (my home town) was most cordial. We have also visited projection rooms in Louisiana and California, and the treatment accorded us was gratifying. Neither Sgt. Erdman nor I are members of the I. A., but we both look forward to becoming union members after the war.

I hope this letter cleared up a few things for you and if there is any further information that you think the readers of I. P. would be interested in, please drop me a line in care of the theatre here.

Pvt. Allan V. Hughes
Ft. Benning, Ga.

Absorption of Empire Union by Local 306 Upheld by Court Decision

THE suit brought against the Empire State Motion Picture Operators' Union, Inc. (which was merged with Local No. 306, New York City last July) by three disgruntled members received a knockout blow when Kings County Supreme Court Justice Charles S. Colden dismissed the action. The plaintiffs, who were accused of being stooges of their employer, the Combined Century Theatres, Inc., sought to set aside the election of Local 306 officers as officers of the Empire Union, which was part of a plan by which members of Empire became members of Local 306. They claimed in their suit that there had been a conspiracy to destroy the Empire Union and to misappropriate its assets.

The defendants in this suit, which included the former and present officers of Empire, testified that all steps taken were for the purpose of enabling the members of Empire to achieve their goal of many years to become members of Local 306. They accused the plaintiffs of acting in bad faith in bringing the action and presented evidence to the court tending to tie up the plaintiffs' action with the Combined Century Theatres, Inc., involved in another suit in the same court attacking the proposed dissolution of Empire as a separate union. It was pointed out to the court that since the members of the Empire union became members of Local 306, in many instances the scale of wages in the theatres in which they are employed has been raised.

During the trial, Father John P. Boland, former Chairman of the New York State Labor Relations Board, testified as to his efforts to eliminate the dual unionism that existed in the city.

"Upon all the evidence," stated Judge Colden, "the plaintiffs' case is without merit. They failed to establish by a fair preponderance of credible proof either that unlawful means were used or that an unlawful end was sought by the defendants. The transactions here attacked were in all respects proper and lawful. Moreover, there is substantial evidence jutifying a finding that the plaintiffs ratified the acts complained of, and that this action was not brought in good faith or for the best interests of Empire and its individual members. The Court is convinced that the members of Empire benefit in a substantial manner as a result of the merger."

In commenting on the decision, Herman Gelber, president of Local No. 306 and of the Empire Union, issued the following statement: "Of the utmost significance to me in the decision of Judge Colden is his statement that the action was not brought in good faith or for the best interests of the Empire Union. This should serve as a warning to those exhibitors who try to interfere with internal union problems, to keep hands off."

BACK THE ATTACK
BUY WAR BONDS

ANALYSIS OF A POWER AMPLIFIER

(*Continued from page* 12)

terminal condenser C-21 is introduced in series and offers considerable additional impedance to the lower sound frequencies.

Pulsating d.c. speech current flowing through the primary of transformer T-127-B induces a.c. of corresponding frequency in the transformer secondary, hence speech current in the two output tubes is pushpull—the two tubes are 180 degrees out of phase with each other in respect to speech current.

Corresponding a.c. appears across the secondary of transformer PR 158 which may thus be regarded as the source of an a.c. circuit, the load of which is the voice coil or coils of the speaker or speakers. The number or type of speakers used determines the setting of switch S-4. From the blade of the switch trace right and down to the two o'clock terminal of receptacle 1126. From the six o'clock terminal of that receptacle trace left and up to the lower side of the output transformer secondary. The six o'clock terminal, and the external wire plugging into it, are common to both the speaker voice circuit and the speaker field circuit.

Receptacle 20021, which is connected directly in parallel to this voice line, is used for a relatively high impedance monitor speaker. This monitor is of the dynamic type, with its own built-in field supply rectifier connecting directly to an a.c. line.

FOUR SIMPLEX INSTALLATIONS FOR WEST POINT

National Theatre Supply Company announces that it recently completed four de luxe theatre installations of Simplex sound and projection equipment at the United States Military Academy at West Point. The installations are further evidence of the Army's recognition of the value of visual education in speeding the task of turning out top-flight officers.

These installations, which mark the expansion of West Point's intensive visual education program, have been made in the lecture halls of the East and West Academic Buildings and Washington Hall, and consist of Super Simplex Projectors, Simplex Type E Sound Systems with d.c. excitation, Peerless Magnarc lamps, National 40-ampere rectifiers and Walker screens.


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The Cathedral, Mexico City

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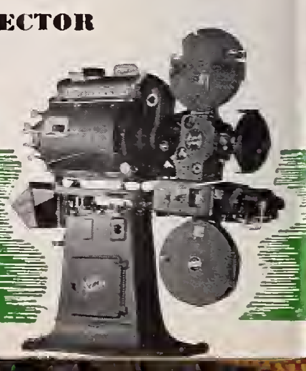
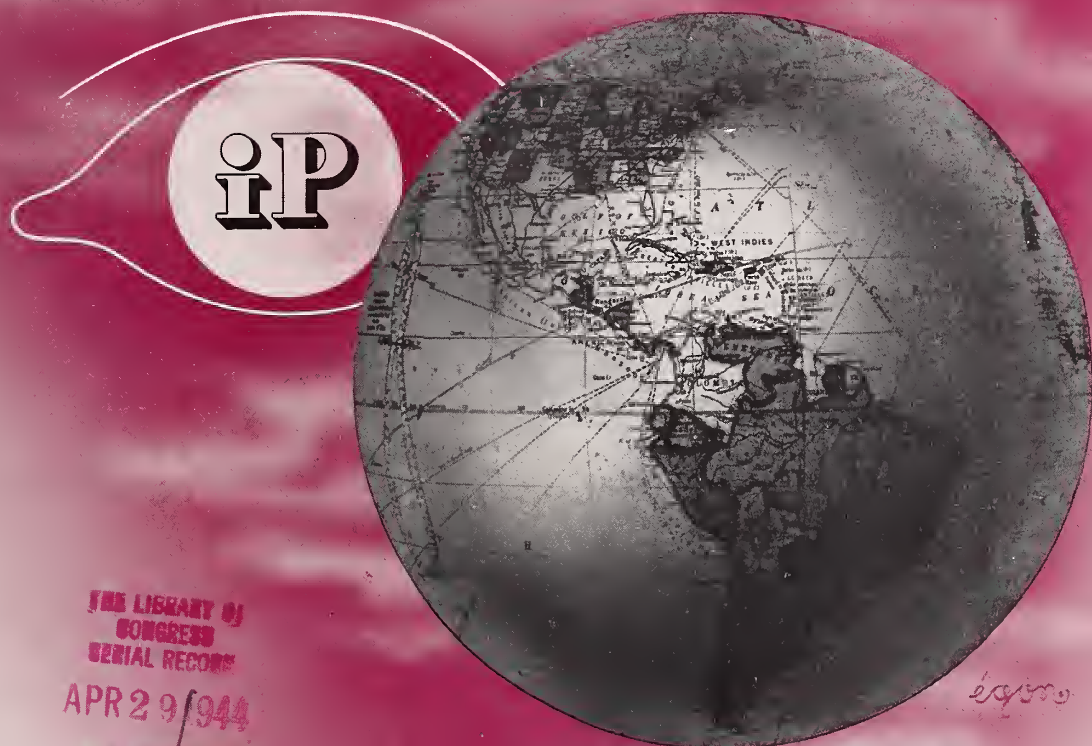


INTERNATIONAL PROJECTIONIST



APRIL 1944

VOLUME 19 • NUMBER 4

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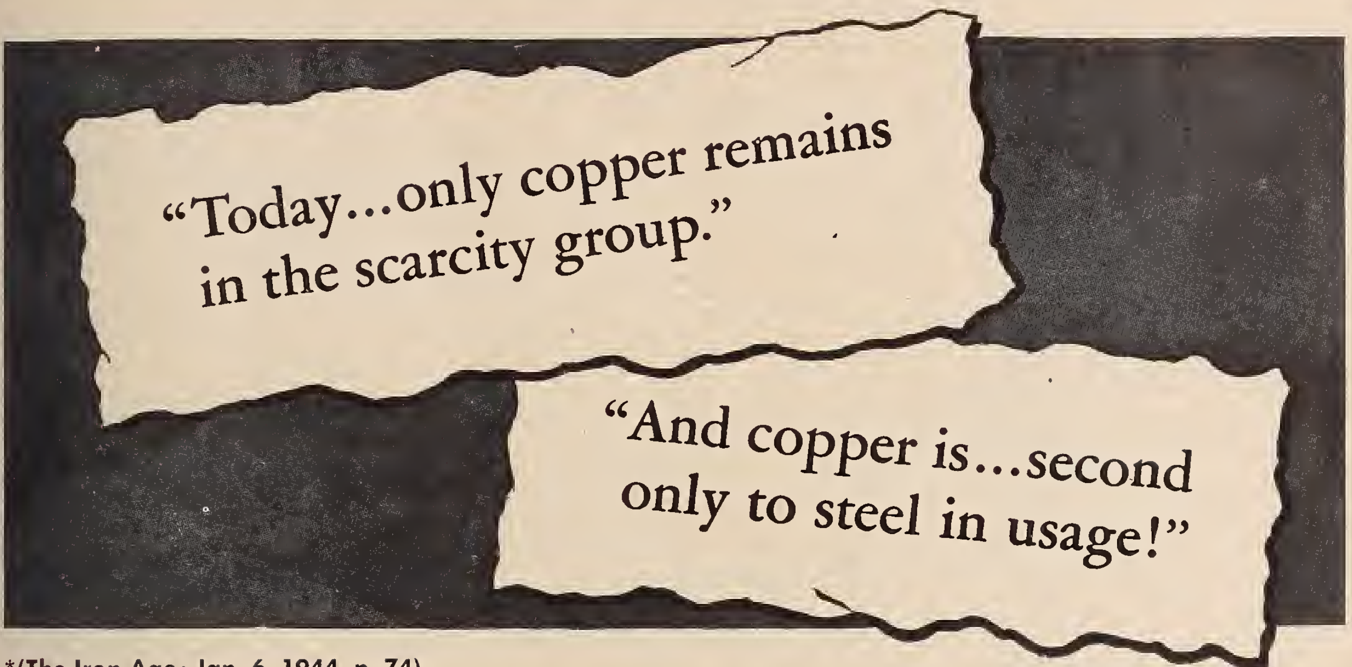
TWO QUOTES* TO REMEMBER!



*(The Iron Age: Jan. 6, 1944. p. 74)

TODAY, "usage" refers primarily to war usage, and "scarcity" is a word of challenge to every American!

That's why we remind you again to save the copper that drops from your Victory and "Orotip" Carbons to the bottom of your lamp housings . . . and to strip off the copper that is left on the stubs you remove from their holders.

Then turn it all in to your distributor, or to your local salvage headquarters, so that it can be put back into war-essential products.

For additional economy of copper, and carbons too, a bulletin describing completely the operation of the Victory High Intensity Carbons . . . "National," "Suprex," and "Orotip,". . . has been in general distribution. If you have not received your copy, write today. National Carbon Company, Inc., Cleveland 1, Ohio, Dept. 10 D.

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INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

NEWSREEL correspondents and the War Department have worked in close harmony since Pearl Harbor, with the photographers in the combat areas more or less doing their own security censoring. The fact is brought out in a statement by the War Department that less than 3 per cent of the combat film footage photographed by accredited newsreel correspondents has been withheld for security or other reasons.

It is also interesting to note that of the less than 3 per cent of newsreel film footage withheld by the Film Security Section of the War Department Bureau of Public Relations a large proportion is later made available to the newsreels and hence to the public as soon as the demands of military security have been released. Eventually almost 99 per cent of all newsreel correspondents' combat film is released. The remaining 1 per cent which remains permanently deleted is material which could possibly be of aid or comfort to the enemy in giving him advance information on new developments and weapons or materiel, of troop movements and installations or other valuable data. The figures speak well of the intelligent manner in which the correspondents have been and are doing their jobs under daily difficult conditions.

• • •

The War Department, incidentally, has been of inestimable aid to the correspondents in processing film and now in furnishing emergency supplies of raw material. The Army also transports the correspondents free of charge and supplies them with couriers when they are in combat areas.

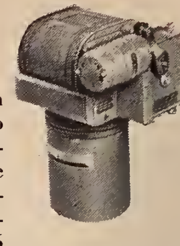
Arrangements have been made for a film bank which will permit newsreel correspondents in the field to borrow U. S. Army Signal Corps raw film when necessary. Such borrowed film will be returned to the Army by the newsreel companies, but the arrangement protects them from being left without raw film in the event of non-delivery of their supplies. Film is processed by the Army usually within 36 hours.

• • •

While this country has carried mass production of war materials to the greatest level ever reached anywhere there still is no stagnation in the development of improved devices for coping with the enemy. As the war progresses new menaces appear and new methods of attack are proposed. Undoubtedly the forthcoming invasion of Europe will in time bring to light many new devices developed during the war and in turn placed into mass production. As problems arise they are presented to groups of the foremost scientists in the country for solution. And solve them these scientists do, with progressive discouragement to the enemy.

You press the button . . . it does the rest

Kodak's K-24 Aircraft Camera is completely automatic. In reconnaissance, you push a switch button on your "stick" and the camera, in the nose or tail, clicks away. In a bomber, it is in the plane's belly, connected, through complex electrical controls, with the bombsight itself. Its focal plane shutter, power operated, has speeds of 1/50, 1/450, 1/900, and "time." It is fitted, as are most other aerial cameras, with Kodak aerial lenses, including Kodak Aero Ektars incorporating elements of Kodak's revolutionary new optical glass . . . interchangeable in a range of focal lengths and speeds for different missions. Uses Kodak Aero Films in prethreaded interchangeable magazines holding 56 feet, enough for 125 pictures, 5 inches square.



K-24 Aircraft Camera, built by Kodak, *"runs its own show"*

Bombardier, at left, is hunched over his bombsight which is electrically coupled with the camera, automatically taking pictures every time bombs are released. At right is a gunner covering the nose with his "fifty."

TANGLING with fighters and flak while making a bombing run . . . or scurrying over enemy country at low altitude on a reconnaissance job . . . the last thing you have time for is "keeping a snapshot record of your trip."

Yet in reconnaissance, that's really what you're out for—and in bombing, you want to bring back "picture information" on the relation of your falling bombs to the target . . . for the camera makes a record of details you couldn't possibly see and remember.

Pretty hopeless, without a camera that "runs its own show" . . . Kodak's K-24 does just that.

On a reconnaissance flight—with no bombs to unload—you press a button for each picture, operating the fixed-position camera by remote control. Or, if you want a series, simply hold the button down, and the camera takes 3 pictures a second.

"Chalking up the score" in the training of bombardier and pilot is another vital phase of the K-24's activity—to know how good you're getting to be, you consult the photographic evidence.

The K-24 is no hero—the pilot and crew play that role. But it does take a lot off a hero's mind.

EASTMAN KODAK COMPANY
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REMEMBER THE PLOESTI RAID?—how at the cost of more than 500 trained fliers, our Liberators fought through one of the most heavily fortified areas in the world, to drop the bombs that knocked out one-third of Germany's oil supply?—how some of the pilots who missed the target on their first run turned back and flew through solid sheets of flame to try again? A stern example for us at home.

BUY MORE WAR BONDS

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INTERNATIONAL PROJECTIONIST

VOLUME XIX APRIL 1944 NUMBER 4

Action of Complex Electric Currents In Projection Room Circuits

By *HENRY B. SELLWOOD*

TWO or more electric currents can exist simultaneously in the same wire and can combine with each other in various ways. In many cases, despite the complexity of the combinations formed, the individual currents or components can be separated at will by means of suitable apparatus.

Simplest of all combinations is that existing when two or more sources of direct current are wired in parallel to the same circuit. The currents unite or add, and the resulting amperage is the sum of all amperages so connected. The currents thus united can be separated, if desired, by connecting suitable resistors in parallel to the common line, when the amperage will divide again through the parallel loads.

If, for example, a source of 6 amperes and a source of 4 amperes, both at the same voltage, be connected in parallel to a single pair of bus bars, a total of 10 amperes will flow in the bus bars. Now, if two resistors are connected across those bus bars, the resistance of one being half again as high as that of the other, the current will divide inversely as the resistance, with 4 amperes flowing through the larger resistor and 6 amperes through the smaller one.

This will hold true at any voltage. Suppose the voltage to be 110, and the currents 6 and 4 amperes, as previously mentioned. Then, if the resistors have the values of 18 1/3 and 27 2/3 ohms, respectively, the current through them will be: 110 divided by 18 1/3, or 6 amperes; and 110 divided by 27 2/3, or 4 amperes. If the voltage were 6, the values of the resistors chosen, by Ohm's Law, would have to be 1 ohm and 1½ ohms. Six volts would drive 6 amperes through the first, and (6 divided by 1½) 4 amperes through the second. Three or more direct currents connected in parallel to a common pair of bus bars can be separated in the same way.

If direct currents are brought together in a common pair of conductors in such a way that their voltages oppose each other, the effective voltage will be equal to the value of the smaller voltage subtracted from the larger: that is, the voltages be 6 and 4, the effective voltage in the joint circuit will be 2 volts and the resulting current in the common circuit will be whatever the resistance of the common circuit calls for at 2 volts, in accordance with Ohm's Law.

By connecting resistors of suitably low values across the common bus bars the original currents could be duplicated unless the power source were inadequate. If the two voltages are opposite and equal, however, the effective voltage will be zero and there will be no flow of current.

If three or more conductors are connected to a common point in a complex network, Ohm's Law cannot deal with the case, and Kirchoff's Laws must be applied, which involves considerations beyond the scope of the present review. However, the independent currents produced even in complex networks can be separated from each other except where equal and opposite voltages produce an effective voltage of zero. Thus in a Wheatsone Bridge, which follows Kirchoff's Laws, when the bridge is perfectly balanced, voltages in the ammeter circuit are perfectly balanced and no current can be drawn from that line.

Alternating current can be combined in a single circuit with direct current, and the two separated to a large extent, although separation is never complete. Such combination occurs naturally in the output of devices that function to convert a.c. to d.c.—commutators of d.c. generators, or tube or disc rectifiers. The conversion is never complete. There is always a little a.c. present in the most perfect of such devices—occasionally a good deal of it may be present.

Therefore, after conversion has been effected, it remains necessary to separate the desired d.c. from the undesired a.c. flowing in the same wires. This is accomplished in practice largely by providing short-circuiting paths through which *only* a.c. will flow. These paths consist of condensers. Connected across the common line, they largely short-circuit the a.c. out of such a line, but they never remove it completely because a.c., like any other current, will divide among parallel paths inversely as the impedance of the paths. If the impedance of the circuit is, say, nine times that of the short-circuiting condenser, then nine parts of the a.c. will flow through the condenser, but one part still will continue around the circuit

in which it is not desired. Or, if the ratio of the impedance be 100-1, then 99 parts of the a.c. will flow through the condenser, but 1 per cent of it still will remain in the d.c. circuit.

The separation, or filtering action, can be improved by increasing the impedance of the circuit in which a.c. is not desired. This is often done by adding resistors in series and also by adding a choke coil or choke coils in series. The choke coil, while offering little opposition to the flow of direct current, presents substantial impedance to the accompanying alternating current. At the same time the short-circuiting condensers, which do not short-circuit any of the d.c., offer a path of low resistance to a.c. By such devices the two currents can be separated completely enough to leave the line carrying what is, for all practical purposes, d.c. only—the a.c. component having been reduced to a negligible percentage.

Components and Resultants

Alternating current is generally considered to be that which periodically reverses its direction of flow. But when a weak alternating current and a strong direct current flow in the same wire there is in effect no such reversal. There is only a ripple in the direct current. For instance: when the alternating voltage is in the same direction as the direct voltage, the effect produced is that of an increase in total current flow. When the alternating voltage reverses its direction the stronger voltage still will overrule, and what happens is merely a decline in the current. The "resultant" current is in effect d.c. of fluctuating power.

If the d.c. component were the weaker of the two, then there would be a true reversal of current direction, true a.c.; but it would be irregular a.c. with more current flowing in one direction than in the other.

When two alternating currents exist in the same wire, the nature of the resultant depends on whether the two are in step (phase) or out of step (phase); and if out of phase, to what extent. Two alternating currents of exactly the same frequency and completely in phase would merely reinforce each other, like two d.c. currents connected in parallel. Completely (180 degrees) out of phase, but identical in frequency and voltage, they would totally cancel each other, like opposing and equal d.c. voltages. Neither of these conditions is found in common practice. As a general rule, two or more a.c. components occupying the same wire are not identical in voltage, identical in frequency, or particularly in phase. The resultant, therefore, is a complex a.c. pattern.

The overall or resultant current does not start from zero to rise smoothly and regularly to peak in one direction. Instead it starts from zero, increases, ceases to increase, declines a bit toward zero, increases again, declines again, and eventually reaches or overshoots its peak power after following a complex pattern of hesitations and jumps. The decline from peak to zero is similarly irregular; and so is the rise and fall of the current in the opposite alternation.

This complex a.c., the result of the presence in the same wire of two or more alternating currents differing from each other in voltage, frequency and phase, can be separated by suitable means into its individual components—or, whenever preferred—into groups of components, each group then being subject to still further separation if desired.

Simple separation of high and low frequencies, flowing in the same wire in the form of a very complex resultant, is effected in common theatre equipment by the loudspeaker "network." This important part of the installation consists largely of condensers, with some resistors and, very often, inductances. High and low frequencies constituting a complex resultant in the same pair of wires also are separated by electrical arrangements built into most amplifiers for the purpose of adjusting their frequency response. In the latter instance, however, the undesired frequencies are short-circuited and thus discarded.

There is a large class of these circuits which break down complex a.c. resultants into groups of frequencies. Such circuits are called filters or networks, and further subdivided as "band pass" and "band stop" filters. They can be designed to pass (offer low impedance to) or stop (short circuit) either all the low frequencies up to a desired point, or all the high frequencies down to a desired point. Also, similar circuits can be designed to favor or to discriminate against any desired frequency or group of frequencies.

The apparatus producing these results consists of condensers, resistors and inductors. The results obtained depend partly on how these devices are connected in circuit. If, for example, an inductance is bridged across a pair of wires, while a condenser is placed in series with one of the wires, the arrangement will favor transmission of the higher frequencies. The lower frequencies will find difficulty in passing through the condenser and an easy short-circuit path through the inductance. Such an arrangement is a simple high pass filter. Formulas exist by which it is possible to calculate the exact value of capacitance in the condenser, and the exact value of inductance in the coil that will produce the desired frequency separation.

If the arrangement just described is reversed, with the inductance in series with the line and the condenser bridged across it, the effect will be reversed and the grouping will constitute a low pass filter.

Filters of the type described are not "sharp." They do not discriminate abruptly between different frequencies in the sense of passing without any loss all frequencies above a certain point, and passing nothing whatever of any frequency below that point. In a filter of this kind designed for "cut-off" at, say, 300 cycles, some transmission of frequencies below 300 cycles will, nevertheless, take place, and some frequencies above 300 cycles will suffer measurable loss.

Filters of more complex nature, usually embodying several condensers and several inductances in somewhat intricate circuit arrangements, can be designed to effect a very sharp and abrupt separation of a.c. frequencies. Even more accurate separation can be effected by filters embodying condensers in which the insulating material is a carefully proportioned quartz crystal. Filters of these complex types, however, are not found or needed in present-day projection room equipment.

Projection Room Filters

Separation of electrical currents is resorted to in ordinary projection room apparatus for at least five different purposes. When sound power supply is obtained through motor-generator sets there almost invariably are filters in the generator output circuit. It is the function of these filters to separate the d.c. output from the a.c. component which accompanies it as a result of the commutator action.

When sound power supply is obtained through rectifying tubes or discs the output is filtered to eliminate the a.c. component in the rectifier output.

Loudspeaker networks have already been referred to; these do not separate a.c. from d.c., but break up an a.c. resultant into high and low frequency components which are then supplied to separate sets of loudspeakers. In some installations speaker networks have been used to divide the amplifier's a.c. or speech output into three sets of components (low, medium and high frequencies) for the purpose of actuating three different banks of speakers. In some systems, the separation is effected before the final amplifier is reached and different power amplifiers are used for high and low sound frequencies, each amplifier driving its own set of speakers.

Arrangements for modifying the frequency response of amplifiers have already been referred to, but it should also be noted that the design of the amplifier itself is governed by considerations of the frequency response desired and the

(*Continued on page* 12)

Motion Picture Projection in Italy

By *AARON NADELL*

Here is another report on projection in foreign lands as seen by I.P.'s editor-on-leave, Aaron Nadell, now serving with the merchant marine. Some ingenious devices, together with a great deal of frank imitations of German and American machines, are described in the accompanying text, which deals with the region of Southern Italy.

ALTHOUGH ITALIAN motion picture equipment is essentially imitative, copied either from our own or from German models, one or two ingenious projection tricks were seen in Italy that have no common counterparts in the United States.

For example, no projection rooms visited had more than one projector, but the magazines and reels were always of enormous size, permitting continuous projection of an entire feature. Another and stranger novelty will be described later on.

In general, however, the Italians appear to depend on imitation, and their apparatus is actually so advertised. They have a sound system they call the C.G.E. Photophone, which appears to be a Chinese copy of RCA equipment. In projectors, they turn out what looks like an extremely close imitation of the German Ernemann—but reputation is a wonderful thing, and one imitation Ernemann seen by the writer bore the label "Simplex." It had no other visible relation of any kind with the products of International Projector Corporation; even the typography of the word "Simplex" was different.

German Zeiss equipment is also used. Figure 1 illustrates a Zeiss projector. Note the oversize sprockets and the fact that the film path is unenclosed. These are typical characteristics of German projectors. This model, according to information obtained through an interpreter with the aid of pencil sketches, uses the standard Maltese cross intermittent star; but some later German models apparently have a triangular star and a 120° instead of 90° action.

The sound "attachment" in Figure 1 is the gadget mounted at approximately 45° beneath and behind the shutter. Figure 2 illustrates another type of Zeiss sound "attachment."

Zeiss equipment shares with all American makes the reputation of being "very good." Other German apparatus, and all Italian products, are considered inferior by the Italians.

Italian P.E.C.

No complaints, however, were heard about the Italian-made, red-painted photocell which is illustrated in Figure 3. This is a peanut-size cell. It encloses a space roughly ½ x 1½ inches; the overall length, including the ½-inch base, is just under 2 inches, and the overall outside diameter 0.7 inch. Put differently, the complete cell is about the size of your little finger from the tip to the middle knuckle. Its greatest sensitivity is said to be in the red and infra-red region; it is painted red to exclude blue light. It is gas-filled, with cesium cathode, and rated at 400-500 microamperes per lumen. A special type, with its principal sensitivity in the invisible infra-red region, and a rated output of 800-1000 microamperes per lumen, is also available.

Used with this cell is the familiar type of exciting lamp operating at 8 volts, 4 amperes, Italian made. Italian-made tubes also are exact duplicates of American tubes, and bear the same type numbers: 5Z3, 6L6, etc. Most of the amplifiers found used a pair of 6L6's in their output stage.

Lamphouses combine reflectors and condensers. Those seen operated at 80 volts, and 20 or more amperes. Motor generators only appear to be used for arc power supply. As far as could be ascertained, the use of rectifiers for that purpose is not known.

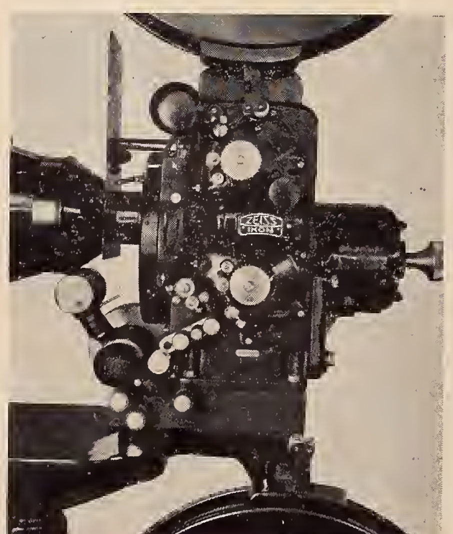


FIGURE 1

They do not appear to know of coated carbons. They do use cored carbons, but the cores occupy a much smaller portion of the carbon diameter—they are extremely thin cores. Their carbons are 6, 7, 8, 9, 12 and 13-mm in diameter, and 7.8, 11.8 and 19.6 inches long.

The type of light obtained with these carbons could not be fairly judged, because at the time theatres were visited electric power had been only recently restored in Naples, and its use was restricted. While the screen lighting observed was not good, and some of it was atrocious, the projectionists were working under the handicap of being forbidden to put full current into their lamps. If the quality of sound and the steadiness of screen image are any fair criterions of the normal quality of screen illumination, then normally it is not bad.

Handicaps of Theatre Operation

Theatres were operating under other handicaps beside shortage of electricity. They had been cut off completely from their normal sources of equipment supply, which lie in the north of Italy around Milan. Their condition in respect to parts and repairs is not as precarious as that in North Africa (described in a previous issue of I.P.) because their severance from their supply sources is of very recent date; but what they have on hand is apparently all they are going to get.

A more immediate handicap was provided by the destruction of a number of projection rooms, reputedly by the evacuating Germans. One projection room visited was strictly a temporary affair, located in a hastily walled-off part of the auditorium. The location appears originally to have housed a ventilating fan. The visitor was told through an interpreter that the original projection room had been maliciously destroyed.

However, it is not too good an idea to believe everything they say in Naples. This is a very ancient city. A kindly citizen, conducting a foreigner through its streets and pointing out the sights, will remark that this structure goes back to the eighth century, and that one to the tenth century—and that one over there? —oh, that's modern, that's only about two centuries old. This place has been invaded and re-invaded so very often that

the people know how to adapt themselves. The Germans have come down and taken it more than once; the Mohammedans have crossed over from Africa and conquired it; the French and the Spanish have held it; it has been part of the States of the Church and has been forcibly taken from the Church; the inhabitants have had to learn ways of surviving under calamity. They tell Americans the Germans are barbarians. If the impossible should happen and the Germans recovered the place, no doubt they would tell the Germans the Americans are barbarians. All that can be said accurately about the recent destruction of Naples projection rooms is that it happened somehow.

However, a very interesting question was asked by a supply dealer. This man inquired into the possibility of buying American projection supplies, now that he is cut off from his former sources of equipment. But what he principally wanted to know was this: if he bought American supplies would he be allowed to keep them and re-sell them, or would the American Army come around as soon as he had paid his bill and confiscate the merchandise? (It must be a lot of fun being a business man under the Axis.)

Safety Measures Fair

Projectionists work in one-man shifts, 6 hours a day, 7 days a week. For this they are paid 1,000 lire (ten dollars) per week. The purchasing power of that amount of money is very uncertain. It may or may not have amounted to an adequate wage in time of peace; but prices are skyrocketing at present. Also, they are rising very unevenly. Admission to theatres visited costs only 2 to 5 cents, but food prices appear to be about as high as back home. Wine prices also are nearly as high as at home, and the population must buy wine because the water is unsafe.

Bombing of the streets has cracked sewer and water mains; the sewage is seeping into the drinking water; water cannot safely be used unless it is boiled and there is a desperate shortage of fuel. Clothing prices also appear to be high; a common belt was priced at $2.50; which

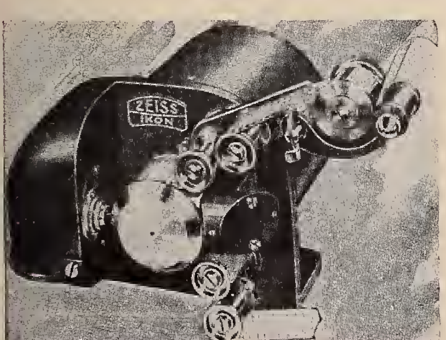


FIGURE 2

would mean the projectionist has to work more than a day and a half to pay for a belt. Almost everyone seen in the crowded streets of this city of a million people presents a ragged appearance, sometimes combined with a cultured bearing and a knowledge of several foreign languages.

Projection rooms visited were moderately fireproof in appearance. Even temporary wiring was in cable, and practically all equipment was housed in metal cabinets. Entrance stairways and ladders seen were invariably of iron. There were no fire extinguishers, however, and not more than one exit. Film cabinets are in use. Arc ventilation to outdoors was not found.

There appears to be rather widespread use of long and narrow auditoriums without upholstery on the chairs and with tin ceilings, the whole giving somewhat the impression of old-time nickelodeons. Seats were not reserved in the theatres visited. Ushers are middle-aged men and they are uniformed; house lighting is very dim but the ushers use flashlights.

The dim house lighting may be related to the generally poor screen lighting; in one important downtown theatre screen lighting was very bad, almost impossible. In another, of approximately the same size, with roughly the same size screen, and the identical arc current, screen illumination, while not good, was only slightly less than passable, according to American standards. The reason for this discrepancy could not be learned. Nowhere was screen lighting anything that could be called brilliant, but the restrictions on the use of current were possibly responsible.

Some quality was fair; approximately equal to pretty good American standards of about 1935. Unsteady screen images were not found.

American films are reprinted with Italian soundtracks. This has been done at studios in Rome. The audiences appeared satisfied; but lack of synchronism with lip motion was distinctly apparent in close-ups. Italian films also are shown. GI patronage is not as generous as in North Africa. There, service men saw Hollywood pictures with their original soundtracks, and explanatory captions in French for the benefit of the local audience. American pictures with Italian sound are naturally less appealing to Americans.

A projection room that appeared to be fairly typical had a German "Bauer" projector. It resembled the Ernemann —they all do. The lamp operated at 90 volts, 20 amperes d.c., but the normal lamp current was said to be 35 amperes. The pedestal was of modern, enclosed type, but narrower than modern American pedestals. It flared out near the floor

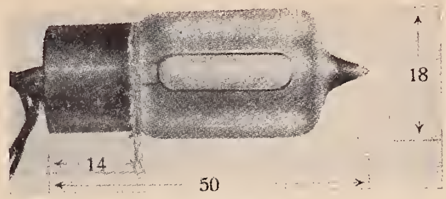


FIGURE 3

to a base area approximately as large as ours. The drive motor was mounted under the lamp, and connected to the projector mechanism by a canvas belt about an inch broad. The soundhead bore some resemblance to that of Figure 2, although differing in details. It was mounted on the pedestal to the rear of the projector.

In this Bauer projector—in fact, in most others seen in Italy—the hand crank is permanently fixed in place in the usual position, and revolves while the machine is in operation. The projectionist has to keep out of its way. The film path, as in all projectors seen, is unenclosed.

"Booth" Details

A three-tube p. e. c. amplifier was mounted on the projection room front wall, connecting to the soundhead through a coaxial cable that looked about an inch thick. The main amplifier was in a cabinet roughly the size of the old-fashioned W.E. motor speed control cabinet, though slightly taller, and placed in about the same position, at the front wall of the projection room, under the projection port. A small emergency amplifier was mounted along a side wall. The monitor was a radio-type cone speaker, about 7" in diameter, unbaffled and unenclosed. It was hung, like a picture, by its connecting wires.

The arc motor generator was installed in a kind of miniature cellar beneath the projection floor. To do any work on it required the projectionist to stretch himself prone, for the little "cellar" was only about three feet high.

At the rear wall was a rewind table with hand rewinder—this table was in reality the top of the film cabinet, which had compartments for about a dozen reels. The cabinet appeared to be built of thin metal without asbestos insulation or any other heat protection. There was no patching device. A little bottle of film cement dangled from a string near the rewind table.

No open wiring was seen except the leads to the loudspeaker, but the motor-generator field resistors, mounted on a side wall near the power switchboard, were wholly unenclosed. They were of the wire-wound slide type—that is to say, resistance was varied by moving a sliding contact up or down along a coil of uninsulated resistance wire.

The switchboard nearby was of the

very old-fashioned marble base type, with brass toggle switches. Fuses were enclosed. A line voltmeter, and a voltmeter and ammeter for the d.c. output of the motor-generator, were mounted on this board.

The projection angle in this theatre was zero, the throw roughly 70 feet, and the screen image approximately 12 feet wide.

The projection room would not have measured more than about 6 feet wide by 8 or 9 feet long. There was, as said, only one projector, and only one projection port. There were no spots or other auxiliary entertainment equipment. There was no record player. And of course there were no changeovers and no faders. Sound volume was controlled by a dial on the amplifier cabinet.

Mounted on the rear wall there was a little box, apparently of bakelite, measuring about 6 inches high, 4 inches wide, and 3 inches deep, with a brass toggle switch just above it. Inside this little box, the cover of which was removable, was a baby 3-cell, 6-volt lead-plate storage battery. Its capacity, at a guess, must have been about 2 ampere-hours. This battery powered six 6-volt automobile lamp bulbs located at various points in the auditorium. That was the emergency lighting arrangement for use in case of power failure. The little battery was recharged, when necessary, through a dropping resistor connected to the output of the arc supply motor generator.

1 Projector, 2 Theatres

Not only did no theatre visited have more than one projector, but by a unique arrangement a downtown exhibitor arranged to make his single projector supply entertainment to two auditoriums. These auditoriums were apparently (like the old nickelodeons) mere stores that had been fitted with seats. They had a common entrance and common box office, and the way it was worked was: after one filled up, patrons were admitted into the other. Each had its own screen and its own loudspeakers.

The projection room was L-shaped. Think of a projection room about the size of a small hall bedrom, with a dark alleyway leading off to the left along the front wall. To put it differently: if you walk up along the left side of the projector to the front wall of the projection room, and then turn left, you can keep walking through a dark, tunnel-like alley. The projection room lighting is arranged to keep that alley dark. At the alley's end there is a mirror, about four feet square, set at an angle of 45°.

The projector looks straight out at auditorium No. 1 in the usual way; but when No. 1 is filled and patrons are admitted to auditorium No. 2 a little prism arrangement is pivoted into place in front of the projection lens. This prism provides the light. Some of it continues on its usual path to the screen of auditorium No. 1; some of it is deflected at right angles by the prism and forms a light beam down the dark alley. This light beam strikes the mirror which is mounted at the end of the alley at an angle of 45°, and from this the light is reflected through a large projection port to the screen of auditorium No. 2.

How correct focus was obtained in auditorium No. 2 unfortunately cannot be reported. The show was on at the time this theatre was visited, and it was not possible to examine the prism arrangement closely without getting in the way of the light beam. There may have been an additional lens incorporated in the prism assembly, or the prism may have been specially ground. Auditorium No. 2 appeared to be shorter than No. 1 but not enough so to make up for the length of the alley. Questions asked through the interpreter did not bring satisfactory answers because the interpreter did not know such English words as lens and prism.

It *is* possible to report that the use of the prism deflector made no noticeable difference in the sharpness of focus or definition in auditorium No. 1. Auditorium No. 2 not being in use, the visitor was permitted to swing the prism in and out of action, at the same time watching the No. 1 screen through the viewing port. The only effect visible was a distinct loss of light while the prism was in operating position. However, the light was none too good at any time.

Aside from this feature, the projection room presented no very marked points of interest. The projector was an imitation Ernemann made by Cinemeccanica of Milano. The lamp was by the same manufacturer. The arc supply was obtained from a motor-generator actuated by a 3-phase, 260-volt a.c. and capable of delivering 80 volts, 40 amperes d.c. The full output was not used, however, because of restrictions. The lamp had both a condenser and a reflector mirror.

The projectionist apologized for his equipment, saying it was old; but no theatre it was possible to visit had anything very markedly superior. It was certainly well maintained. An old American unenclosed Powers 6B was kept in this projection room as a reserve. It appeared to be in perfect working order. The projectionist pointed to it proudly; called it a very fine machine, and fully as good as his much more modern Cinemeccanica.

The pedestal was of the modern enclosed type and approximately of the same dimensions as the smaller American models.

There was no pre-amplifier. The main amplifier was mounted on a side wall. It had two 616's in the output stage, a 5Z3 rectifier (all tubes Italian-made) and a built-in monitor speaker. There was also an emergency amplifier with a pair of 45's in the output stage.

This particular house had begun to feel the effects of the shortage of projection equipment. Its projector motor, which fits inside the housing on the drive side of the mechanism, had burnt out and could not be replaced. A different motor, almost half as large as the projector head itself, had been bolted to the pedestal. It connected by a leather belt to an improvised pulley that had been added to the mechanism.

SECOND WHITE STAR FOR DEVRY

The DeVry Corporation, manufacturers of motion picture sound equipment, has been notified of its receipt of the second white star for its Army-Navy "E" flag. The award denotes continued production excellence for the war effort on the part of the company's personnel.

COMPLEX ELECTRIC CURRENTS

(*Continued from page* 8)

values of many of the condensers, resistors, and other parts in the amplifier are selected by the designer accordingly. Hence any replacements should be made with parts having the identical values of resistance, capacitance or inductance; if this is not done the response of the amplifier may be changed and the sound will be distorted.

Filters are also used in the projection room to remove needle scratch from the non-synch reproduction. Needle scratch consists largely of frequencies above 4,000 cycles. The filter acts to by-pass a considerable portion of those frequencies. Naturally, it also by-passes a comparable percentage of sound frequencies above 4,000 cycles. Therefore, the design of these devices is a matter of somewhat delicate balance between leaving in too much scratch on the one hand, or by-passing out too much high frequency sound on the other.

The ultimate mathematics underlying filter design is extremely involved—for that matter, so is the ultimate mathematics behind Ohm's Law—but practical formulas have been worked out through use of which filter design can, in many cases, be reduced to simple algebra, not very much more difficult than Ohm's Law. The projectionist, of course, has no occasion to design filters, but some small knowledge of their design can often be of help to him in their care and maintenance.

Motion Pictures in War and Television Dominant Topics of SMPE Meeting

APPLICATION of motion pictures to war needs was the dominant theme of the fifty-fifth semi-annual conference of the Society of Motion Picture Engineers held at the Hotel Pennsylvania, New York City, April 17, 18, and 19.

According to W. H. Offenhauser, Jr., chairman of the Papers Committee, thirty-eight technical papers were read at the meetings. A symposium on television highlighted the opening session, with talks by Wyllis Cooper, National Broadcasting Company, on "Television from the Viewpoint of a Motion Picture Producer," and "Television from the Viewpoint of a Broadcaster," by W. C. Miner, Columbia Broadcasting Company.

Owing to wartime conditions affecting hotel accommodations and food rationing, it was decided to dispense with all social functions usually held during these meetings.

Herbert Griffin, president of the Society, presided at the opening session, at 10 o'clock Monday morning, April 17. The technical sessions were held each morning and afternoon of the three-day conference.

Appended hereto are abstracts of some of the papers read at the technical conferences:

DIRECT READING AUDIO FREQUENCY METER

(10 to 50,000 cycles, with a linear scale calibration)

W. R. Strauss

North American Philips Co.

An instrument capable of indicating audio frequencies of 10 to 50,000 cycles to accuracies limited only by the panel meter or pen and ink chart recording meters, regardless of audio voltage variations is described herein.

Source in audio frequency voltage is fed into a high impedance grid circuit and due to plate saturation of electron discharge tube the incoming frequency wave shape is changed to a square wave, which retains the original frequency but is not affected by variations in signal voltage amplitudes. Only one volt is necessary to trigger the grid circuit.

Output of first tube is amplified by a direct coupled multi-vibrator (flip-flop) circuit, consisting of two tubes whose circuit constants have no resonant effects on above frequencies. Wave shape remains unchanged and amplication is constant. Appropriately chosen capacitive and resistive network then permit the integrated pulses to collect on the grid of the countertube circuit.

To produce a linear frequency calibration, the grid circuit of the countertube is biased to plate current cut-off with zero signal input. A 5 Ma milliammeter in the plate circuit serves as a pulse counting device, and provisions are made to use an external recorder.

A means of recalibrating instrument when tube replacement is necessary is incorporated to use the ac line frequency or its second harmonic. Gas-discharge tubes employed in the B voltage supply serve to stabilize operation from 105 to 125 volts with less than 3% full scale change in frequency indication.

A plate overload relay is used to protect the panel meter, should frequencies applied to input circuit be greater than those for which the selector switch is set. An overload pilot lamp is mounted on the panel front.

A FILM FOR MEASURING PROJECTOR STEADINESS

M. G. Townsley

Bell & Howell Company

A film is described, which has circular perforations in each frame which are punched after exposure, and processing of the film. The perforations in each frame are located from the normal film perforation and from the edge of the film which is guided during projection. The modification of a standard Bell & Howell perforator for producing this film and a method of checking the accuracy of the finished film are described.

RE-RECORDING OF 35-MM ENTERTAINMENT FILMS FOR 16-MM ARMED FORCES RELEASE

P. E. Brigandi and W. M. Dagleish

Radio Corporation of America

In preparing 35-mm entertainment films for 16-mm release to the Armed Forces a re-recorded 16-mm negative is used for contact release printing. Restricted frequency and volume ranges are applied in the re-recording to meet the limitations of reproduction in the field.

TRAINING FILM FORMULA

Lt. Orville Goldner

U. S. Navy

The terms which so freely emanate from training film activities often result in confusion among both the makers and the users of training films. Further, they contribute to perpetuating the varicolored and mysterious aura which surrounds the whole film business. To carry on an extensive training film program like the Navy's, it is necessary to define terms and procedures in order to eliminate confusion and cut to a minimum the many aspects of the job which are generally considered as unpredictable.

Five factors must be considered in the construction of every training film, *i.e.*, the truth about a condition or set of conditions, interpretation of the truth, visualization, verbalization, and emphases. These five factors make up the basic training film formula. Variations in their application result in the *pattern* of the film. Obviously then the *pattern* of any training film is as interesting and effective as the mental, manual and mechanical skills and equipment used in the development of the formula permit it to be. And the *pattern* of a given training film is established for the purpose of achieving specific pre-determined objectives with a specific audience.

If there is any validity in this defined analysis of the training film, a good training film will result from: (1) A clearly defined set of objectives established in terms of a given audience; (2) A training film pattern —picture and sound style—which is designed to achieve the given objectives with a given audience; (3) The best use of the factors of the training film formula for giving reality and quality to the pattern.

PHOTOFLASH LAMPS AS ILLUMINANTS FOR HIGH-SPEED MOTION PICTURE PHOTOGRAPHY

Henry M. Lester

High-speed motion picture cameras capable of taking pictures on continuously moving film at the rate of upward of 2,000 frames per second produce exposures of very brief duration: 1/10,000 to 1/30,000 second. Such brief exposures obviously call for illumination of great intensity and high color temperature.

Incandescent lamps capable of providing such illumination, especially when operated at voltages higher than their respective rating, have many disadvantages, among them: great power requirements, heavy conductors, emission of considerable heat and others. Since the actual time during which the high intensity illumination is required (the run of the camera after it attains the desired speed) is seldom more than 1 second, it was found that the light emitted by certain Photoflash lamps produced satisfactory illumination for this purpose.

A NEW 35-MM PROJECTOR WITH A NEW LIGHT SOURCE

T. W. M. Schaffers

North American Philips Co.

This presentation is a discussion of a completely new projector with a new light source; *i.e.*, the water-cooled high-pressure mercury lamp. This light source is of very great intensity and is, therefore, suitable for film projection. A uniform illumination of bluish white light produces a very pleasing picture on the projection screen. The intensity is approximately equal to the 45 amp. high-intensity type carbon arc, but has much smaller dimensions, considerably less heat development and greater light efficiency.

Compared with the carbon arc, the high-pressure mercury lamp is free from certain unfavorable conditions connected with the use of the carbon arc. The very small dimensions of this mercury lamp has made it possible to build a new sound film projector with many innovations in design. This projector is fully discussed, together with the important factors involved in the construction of an illumination objective for the water-cooled high-pressure mercury lamp.

TREATMENT OF NAVY SLIDEFILMS FOR PSYCHOLOGIC IMPACT

Lt. J. D. Dresser

U. S. Navy

In preparing slidefilms to teach pilots in the South Pacific how to survive if forced down in enemy territory, the Training Film Branch has carried on experimental work that has definite implications for the motion picture training film field. "THE JAP—HIS HONORABLE SELF," a slidefilm on how to "out-Jap" a Jap, provides a good ex-

(*Continued on page* 24)

Motion Picture Film Regulations of the Underwriters Code

This is the second installment (with a few deletions of matter of no interest to I.P. readers) of the regulations of the National Board of Fire Underwriters anent the handling and storage of nitrocellulose motion picture film. Regulations apparently applying only to studios, film exchanges, laboratories, etc., also apply to theatre projection rooms wherever processes or conditions are similar.

193. *Processing of Film.*—The processing of film, as cleaning, polishing, buffing and other special treatments shall not be done in rooms where other operations are performed, except that in motion picture theatres, cleaning of film may be done in the rewind room. Special processes for treating film shall be provided with such proper safeguards as are necessary for protection against the hazards involved. The inspection department having jurisdiction shall be consulted in regard to the protection needed.

194. *Soldering Cases.*—Soldering cases of film when done in a building shall be conducted in a room used for no other purpose. Walls of the room shall be constructed of 6 inches hollow tile plastered each side to a thickness of ½ inch or its equivalent. Area of room shall not exceed 60 square feet. Opening to room shall not be from another film handling room; it shall be protected by an approved self-closing Class B fire door. Automatic vent shall be provided with a ratio of 70 square inches for each 500 pounds of film. Room shall be equipped with automatic sprinklers with a ratio of one sprinkler for each 15 square feet with proper sheet metal baffles. Quantity of film in room shall not exceed one case.

Note: The use of shipping cases with metal linings of the telescope type which do not need to be soldered is recommended.

195. *Silver Reclaiming.*—The process of reclaiming silver from film shall not be carried on in a building with other processes unless cut off therefrom by standard fire walls. Such sections shall be completely equipped with automatic sprinklers.

196. *Film Cement.* — Compounds of collodion, amyl acetate or similarly flammable cements shall not be kept in the rooms where they are used, in quantities greater than 1 quart; and such material in excess of this quantity shall be kept in a vault. The use of these materials in motion picture theatres and other special occupancies is covered in sub-section 214.

197. *Smoking.* — Smoking, except in rooms especially provided for the purpose, should be prohibited in any establishment handling or storing film, and conspicuous "No Smoking" signs should be posted in prominent places. Matches should not be carried by any employee.

211. *Enclosure for Projectors.*—Motion picture projectors shall be installed in an enclosure in accordance with subsection 191. (I. P., Feb. 1944.).

212. *Rewinding.*—(a) Rewinding of films shall be performed either in a special rewind room at an approved location, or in the projection room. If done in the projection room, approved enclosed-type rewind machines should be used. An approved can for scrap film having a self-closing hinged cover shall be provided.

(b) Rewind rooms shall be at least 80 square feet in area, with walls and doors in accordance with the requirements of subsection 112 and with ceiling of equivalent fire resistance, and shall have a vent to the outside of the building of not less than 27 square inches [See paragraph 191(g)]. Exhaust ducts shall comply with paragraph 191(h). Shelves, furniture and fixtures shall comply with paragraph 191(f).

213. *Care and Use of Film.*—Motion picture film used in connection with the projection of motion pictures (as in theatres, motion picture theatres, screening or projection rooms, sound recording studios, and motion picture titling studios) shall be limited and kept as follows:

(a) The quantity of film in any projection room or rewinding room not equipped with an approved system of automatic sprinklers shall be limited to that given below; if equipped with an approved system of automatic sprinklers, double the quantity specified may be permitted.

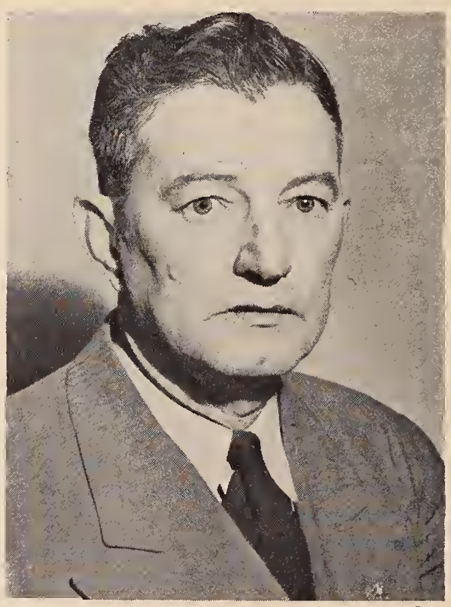
(1) In a projection room, constructed of brick, hollow tile, concrete or other approved masonry, not exceeding 125 pounds (25,000 feet of 35 mm film);

(2) In a rewinding room constructed of brick, hollow tile, concrete, or other approved masonry, separated from projection room with openings thereto protected with approved fire doors, not exceeding 125 pounds (25,000 feet of 35 mm film);

(3) In a projection booth constructed of metal frame covered with

(*Continued on page* 28)

Presenting: J. R. Marksbury



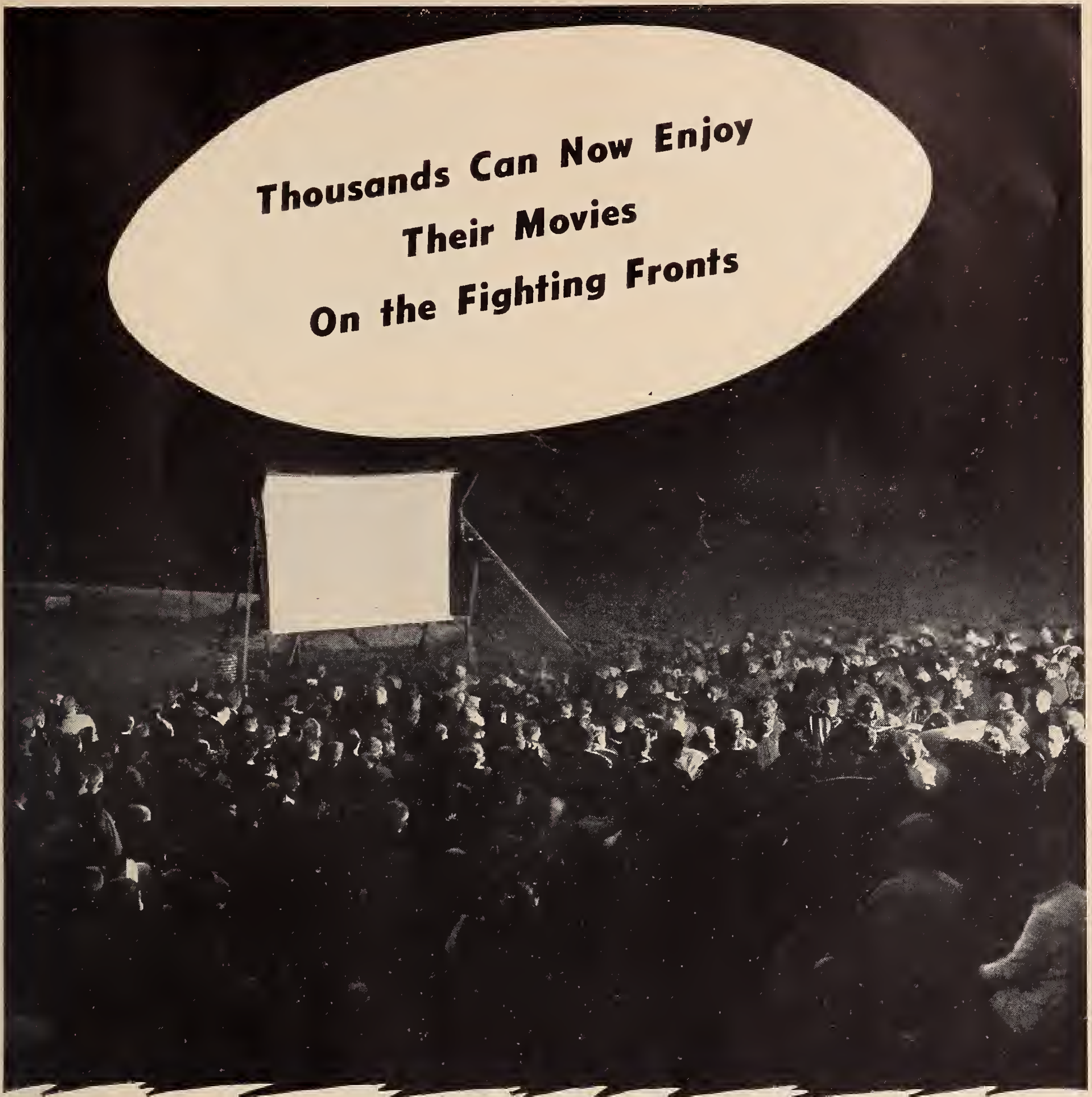
JAMES ROBERT MARKSBURY, business agent of Local 355, I.A.T.S.E., Sioux City, Ia., originally was elected to the post in 1915, has held the job ever since, and undoubtedly will be re-elected next month.

His vocation more or less was accidental, for some time before 1910 he was palling around with a chap who ran an Edison exhibition model projector at the old Majestic Theatre in Sioux City, who prevailed upon him to quit a job with the North Western R.R. for a ticket taker's job, with the understanding that he would be given an opportunity to become a projectionist, which he did in 1910.

With the late Charles Bateman and Burt Martin, the present secretary, he aided in organizing Local 355 and at the first election in 1914 Marksbury was elected vice president. He also took over the duties of business agent and was formally chosen for that post in 1915.

Marksbury has been instrumental in securing considerable legislation in favor of projectionists, and is constantly working for better working conditions for the craft. He was a delegate to the Chicago convention first in 1915 and has continued to represent Local 355 at the national conventions ever since.

Marksbury's hobbies are pheasant and duck shooting during the fall season and fishing during the summer and, as well, meeting the oldtimers at all conventions he attends, renewing acquaintances and having a little fun outside of the formal sessions. He is married and has two boys, both in the Navy. Pat, the elder, is a projectionist and expects to return to the work when the war is over, but Jim, the younger son, intends to make the Navy his life's work.



Here, at a General Hospital near Constantine, North Africa (Algeria), outdoor movies are shown once a week. A Signal Corps Photo.

IN THE SPOTLIGHT

By *HARRY SHERMAN*

SEVERAL weeks ago a projectionist working at one of the de-luxe theatres in a large mid-western city called the attention of the service inspector to the condition of the fire extinguisher in the projection room. The plunger rod of the extinguisher had so corroded that when the projectionist checked the equipment the handle pulled off completely, rendering the device inoperative. Three other fire extinguishers were then checked and all were found to be in similar condition. Naturally, the projectionist was very much concerned about this state of affairs for it not only affected the safety of his own person and of valuable hard-to-replace projection room equipment, but it also endangered the lives of the theatre patrons.

The inspector in this particular instance was so impressed with the concern of the projectionist that he spread the idea to other projectionists in his territory and a check-up of fire extinguishers was immediately undertaken. Many similar situations of inoperative extinguishers were found, and in some instances no fire fighting equipment was in evidence.

We urge our readers to bring this matter to the attention of their theatre managers without undue delay, and to institute a campaign of more careful and more frequent inspections of projection room fire fighting equipment. *One ounce of prevention is worth more than a pound of cure.*

● Sound service engineer members of various I. A. locals have formed an organization called the Associated Electronic Engineers. To date, forty-two I. A. locals are represented in the membership of the new organization, with members working in twenty states. Both major sound service organizations are represented in the membership. Negotiations pertaining to wages and hours are now being discussed and favorable action is anticipated.

Many plans for the interest of the membership are in process of formation, details of which will be published in these columns when they are completed. An educational committee which will function as a clearing house for technical information has already been formed.

● Hats off to the officers of Local No. 154, Seattle, Wash., for their prompt action in stopping the road showing of the picture "For Whom The Bell Tolls" in their city. The screen attraction was advertised as a road show and when the union officials demanded road show pay for the projectionists the theatre management balked, and issued a statement to the press claiming that the union demands were "prohibitive." James McNabb, business agent of Local No. 154, in reply to this statement declared,

"It is significant that while the company's statement to the press decries the union's position, it is devoid of any reference to the fact that the admission price for this advertised road show was raised from 75c to $1.15, a matter of 53%."

● There are many rumors afloat regarding the role television will play in the post-war period. The importance of television cannot be minimized, and just how it will affect our jobs is something that at the present time is purely guesswork. However, New York City Local No. 306 is not sitting idly by waiting for things to "happen." Come what may, the members will not permit themselves to be caught napping when television does hit the theatres, and for this reason many of them (about 300) are attending the free Electronic and Television courses sponsored by the New York City Board of Education at a cost of $30,000. The basic course includes amplifier and receiver circuit theory, practical shop work with modern testing equipment, and the construction of amplifiers and superheterodyne receivers. This is to be followed with an advanced course in television.

● Henry Jensen and Stanley Hight, projectionist members of Local No. 458, Portland, Maine, were partied by the entire membership prior to their induction in the armed forces. Good luck, boys.

● Harmon J. Smith, member of Local No. 253, Rochester, N. Y., and the senior labor representative of the War Production Board, Labor Division, has been re-elected treasurer of the Rochester Central Trades and Labor Council. Smitty is well known to labor leaders throughout the country and is highly regarded in labor circles.

● Jeff D. Porter, member of Local No. 455, Fort Smith, Ark., and chief projectionist at the Fort Theatre prior to his enlistment in the navy, is now a radio instructor at the United States Naval Training School, A. & M. College of Texas. Porter was recently promoted to Chief Petty Officer, his third promotion in one year. Not bad, eh? By the way, he has words of high praise for the hospitality shown I. A. men in service by Local No. 279, Houston, Texas.

● S/Sgt. Glenn C. Lewis, member of Local No. 760, Livingston, Mont., may be due for a citation for his ingenuity in fixing up an emergency water still from odds and ends found around the camp when his company's battery water still was blown to bits during an enemy raid.

● *Correction:* In our last issue we reported that D. E. Howard, member of Local No. 647, Cheyenne, Wyo., and RCA service engineer in the Shreveport,

I. A. Elections

L. U. 236, BIRMINGHAM, ALA.

President, J. A. Jackson; *vice-president*, Henry Vick; *recording secretary*, J. F. Mankin; *treasurer*, F. E. Walker; *business agent*, Ralph A. Root; *sergeant-at-arms*, Carl Jones; *trustees*, J. T. Amberson, N. A. Kriel and John Cason. Ralph A. Root was elected *delegate to the coming I. A. Convention.*

L. U. 320, SAVANNAH, GA.

President, W. E. Lee; *vice-president*, M. H. Addie; *secretary-treasurer*, A. F. Rehm, and W. P. Kehoe as *business agent*. Kehoe was also elected first vice-president of the Savannah Trades and Labor Assembly.

La., territory had been transferred to the company plant at Camden, and that Ray Stimpert, member of Local No. 222, Shreveport, La., had taken over Howard's duties as service engineer. It seems that our informant reversed the positions of the two aforementioned men. The correct report is that Ray Stimpert, who has been the RCA engineer in the Shreveport territory for a number of years, has been transferred to Atlanta to handle the Industrial and Sound activities for RCA, while D. E. Howard replaced him in the Shreveport territory.

● Frank Cahill, who headed the Sound and Projection department for Warner Bros. Theatres prior to his enlistment with the armed forces, has received another promotion. He is now Lt. Col. Frank Cahill.

● A. B. Zumar, secretary-treasurer of Local No. 257, Ottawa, Canada, received word recently that one of his three brothers serving with the Royal Canadian Air Force has been reported as missing in action for quite some time. We do hope that he will turn up safe and sound when the war is over, as no doubt will many who are now reported as missing.

● Condolences to the widow and family of Joe Moreau, late president of Local No. 299, Winnipeg, Canada, who recently died at the age of 53. Moreau devoted his life to the service of his fellow union men and will be greatly missed by his associates.

● Joe Klynn, member of Cleveland, Ohio, Local No. 162, has joined the ever increasing list of grandpops. We have quite a few grandfathers in our 25-30 Club and we are sure that Joe will feel very much at home with them. How about sending in your application for membership, Joe, we will be very glad to have you join our ranks.

● Orchids to Local No. 110, Chicago, Ill., for its contribution of $10,000 to the Red Cross drive last month.

● Death comes to us all at the proper time, but it is unusual for a local to report the death of two members on the same day and of the same cause. Several weeks ago Tom Kenny and Albert Halloway, members (the former a charter member) of Local No. 173, Toronto. Canada, suffered heart attacks and died within a few hours of each other. Slowly but surely the oldtimers are passing out of the picture.

● We understand that Floyd Blackman and R. O. Taylor, members of Local No. 380, Bartlesville, Okla., hold membership cards in the local since 1914, a period of 30 years. Have you boys heard about the 25-30 Club? For further information we suggest that you refer to the March, 1944, issue of I.P., page 17.

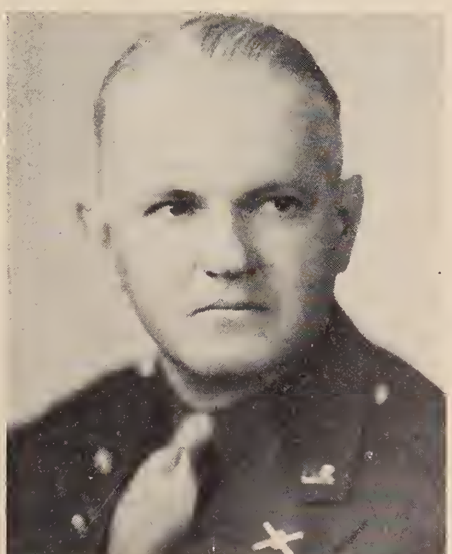
● Our good friend, Oscar Neu (Neumade Products), always has the welcome mat out for out-of-town projectionists visiting New York. Oscar is a swell host and has loads of friends throughout the country. One of these days we plan to corner him until he explains a few of those tricks he likes to mystify us with—particularly the disappearing dollar bill.

● Eugene J. Atkinson, the newly elected business agent of Local No. 110, Chicago, Ill., and Clarence A. Jalas, his assistant, are formulating plans whereby the union members will be consulted on all matters pertaining to the operation of the local. In a statement to the press Atkinson said:

"Contracts of all theatres will be open for inspection. We are entering into uniform agreements so that houses of similar classification and capacity will be paying the proper wage scale. There will be no deviation from the standard wages unless, at an open meeting the officers are instructed by the members to make such a change."

● We are glad to learn that Jimmy Fensore, Local No. 277, Bridgeport, Conn., has recovered from his recent illness and is back at his old stand in the projection room of the Poli Theatre. Hope to see you at the coming St. Louis Convention, Jim.

● Local No. 199, Detroit, Mich., certainly is proud of one of its members who has attained high rank in the U. S. Army. We refer to Lt. Col. Ford D. McParland, executive officer of the 12th Group at Camp Cullum, Calif. McParland attained his rank the hard way. He enlisted as a private in the 125th Infantry and shortly thereafter was promoted to private, first class. He received the following promotions in rapid succession—corporal, sergeat, technical sergeant, first sergeant, second lieutenant, and first lieutenant. He was commissioned a captain to organize Battery A, 210th Anti-Aircraft Reg. (Michigan's own), and later was commissioned a major and battalion executive officer. In June, 1942, he took his organization to the Aleutians, and in April, 1943, he received his present commission. A salute to Lt. Col. Ford D. McParland.



Lt. Col. Ford D. McParland

25-30 Club News

APPLICATIONS for membership in the 25-30 Club have been received from various parts of the country. As we stated last month, all I. A. members are invited to join this organization—the only requirements necessary are at least 25 years membership in the Alliance and a card of good standing in one's own local. This Club is a fraternal organization—no political behind-the-scenes conniving —just a once-a-month get together of old-timers who like to meet and gabfest about the good (?) old days, and to indulge occasionally in a lively debate on matters of general interest.

• • •

The honor of being the first three out-of-town members in the Club goes to the crew of the Lafayette Theatre in Buffalo, N. Y., namely, Fred Taylor, Mike Ostowski and Walter Machette, all members of Local No. 233. Here's hoping you "kids" make the next meeting, Friday, April 28, at midnight.

• • •

The applications of Bert Ryde, Owen J. Kavanagh, business agent and secretary, respectively, of Local No. 233, Buffalo, N. Y., have been received and they will be notified of their acceptance as members in a very short time.

• • •

William F. Canavan, former president of the I. A.; Thad C. Barrows, president of Local No. 182, Boston, Mass., and Allen G. Smith, chief of the Theatre Equipment Section, War Production Board, were obligated as honorary members of the Club at the last meeting. Canavan and Barrows were represented by proxies, but Smith appeared in person to receive his honorary gold membership card.

In a brief address of acceptance, Smith stressed the splendid cooperation extended by the various projectionists' activities in doing their share in keeping the theatres open.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Conservation of Carbon Drippings

The saving of carbon drippings, so necessary to the war effort, could be made less troublesome with the use of a receptacle so constructed that the carbon stubs will be separated from the drippings without special effort. Using a galvanized metal bucket, or any other suitable metal receptacle, place a screen made of one-quarter inch hardware mesh about three inches below the top of the receptacle. All you will then have to do will be to dump your lamphouse receiving tray onto the mesh and the carbon drippings will drop through the mesh and the stubs will remain on top, to be disposed of when the mesh is full of stubs. If desired, a solid lid may also be provided for the container.—C. SHEPARD, *RCA.*

Century Projector Drive Gear Set Screws

To simplify the suggestion offered by Cliff Welch, in the August issue of I.P., I have found that the simplest and surest method of preventing trouble caused by these screws working loose and jamming the projector mechanism, is to permanently seal these screws with DuPont liquid solder. Thoroughly clean the gear hub with carbon tetrachloride, making sure to remove all oil or grease, then spread a layer (about 1/16" thick) of the liquid solder over the screws, letting it harden before using the equipment again. This may be done at night at the close of the show. The liquid solder will harden over night, and yet, if for some reason you should wish to remove the screws, the hardened solder could be picked up by digging it up with a screw driver.—D. FERGUSON, *RCA.*

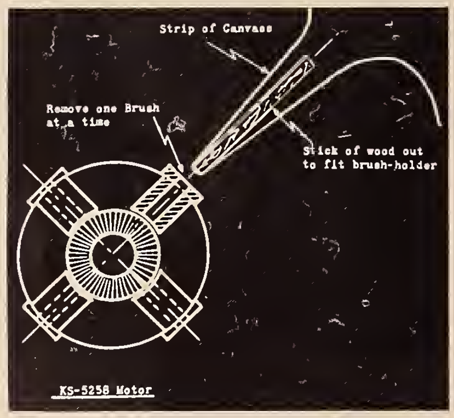
Emergency Operation of Type "A" System

An emergency switching arrangement for the type "A" system using type AM-101 pre-amplifiers has been giving very satisfactory operation. I used two single-pole signal-throw toggle-switches in each AM-101 pre-amplifier. One pair was used to short out the electronic changeovers in each amplifier and was connected to "A" and "B" in the usual manner. The second pair was used to open or close a jumper that was run between the two pre-amplifiers and connected the two photo electric cell coaxial cables together on the cell side of the input condenser. This arrangement enables either AM-101 amplifier to be used for either soundhead output with changeovers made in the usual way.

There is no effect on the response curve with the two PEC jumper switches open and the response and balance with either amplifier used as "emergency" is surprisingly effective. For the jumper I used a piece of shielded cable and ran it directly across from one pre-amplifier to the other, thus making it as short as possible.—G. B. ARMSTRONG, *RCA.*

Cleaning Motor Commutators

Some of our motors have had the commutators turned down so many times that a point has been reached where complete replacement is inevitable. W. R. Connor advises us that when he was in the servicing end nothing but canvas was permitted to touch his commutators. In other words, "nix" on sandpaper or any



other abrasive material. Canvas not only serves as a slight unharmful abrasive material, but also has the quality of absorbing grease and dirt, and almost eliminates the necessity of turning down commutators.

Commutators, such as those in 5258 motors, were cleaned by stretching a strip of canvas over the end of a stick cut so that it may be slipped into the brush holder. (See sketch above). This operation may be done while the motor is running. According to Mr. Connor, this method is used exclusively by the telephone company when cleaning commutators.—*ALTEC.*

Hints for Projection Lamps

On certain high intensity lamps a semi-circular shield can be fastened to the end of the negative carbon guide which will reduce the copper drippings that fly back to the reflector mirror. This shield, which should not be larger than the hole in the center of the reflector, not only helps to protect the reflector during the time the arc is struck but also during normal operation of the lamp.

Lamp operation, as far as the burning of Victor carbons is concerned, may be improved by connecting a piece of regular size lamp cable from the positive connection to the positive carbon guide. In making this change the current only passes through approximately one inch of carbon instead of eight or nine inches when a new carbon is installed. The positive guide is used as a contact.—G. P. KNAPP, *RCA.*

Emergency Battery Replacements for Test Kits

The 7½ volt battery used in the Weston kit deteriorate very rapidly. The drop is greatest in the RX-1 scale where 1½ volts of battery are used. This was corrected in my test kit by adding a single flashlight cell, soldering the leads to the cell.—W. W. WALL, *RCA.*

Re-mounting Amplifier Sockets

I have found that by re-mounting ERPI 43 amplifier power tube sockets, the springs may be cleaned very easily. Instead of bolting the present hard rubber bakelite spring contact assemblies to the socket, bolt them to the amplifier panel with metal strips and the front elbow can be removed, thus leaving the springs intact.—H. E. BEARDEN, *RCA.*

Electrolytic Capacitor Substitution

Concerning the use of capacitors in cathode circuits, it has been found that 450 volt dry electrolytics are occasionally substituted for low voltage capacitors across cathode resistors. Invariably the capacitor will produce noise or simulate an open condition after a few weeks, although frequently it will "form" with an application of voltage corresponding to its rating. It has been my unfortunate experience in the past that such substi-

(*Continued on page* 25)

TELEVISION TODAY

VII.—Television Transmitters

By *JAMES FRANK, JR.*

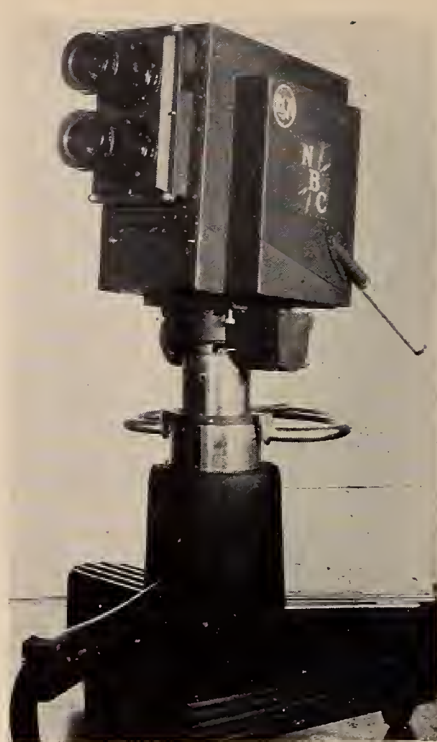


FIGURE 29
Iconoscope camera on pedestal

FOR a number of years RCA has maintained an experimental television transmitting station in New York City. All studio and control equipment is located in the RCA Building at Radio City and the transmitter itself is located atop the Empire State Building. This description of a television transmitter will concern itself principally with this particular installation, which is considered to be reasonably typical for the present status of the art.

Figure 28 is a block diagram of a typical television transmitter such as is now installed in Radio City in New York. This diagram only shows a fundamental system with one camera for pick-up. However, any number of cameras of either the direct pick-up or film pick-up type may be used. They are simply connected into a single channel through a mixer after the signal has passed through its respective video voltage amplifier. "Video" refers to the picture signal. This diagram shows the distribution of the apparatus into three rooms, the studio, the control booth, and the equipment room.

First of all, the image of the scene to be transmitted is focused on the photosensitive plate of the iconoscope in the iconoscope camera. Figure 29 shows the iconoscope camera mounted on a pedestal so that it can be moved about the studio during a performance. It may be raised and lowered by a silent, motor-driven mechanism. The camera itself may be swung at any angle on the pivot on which it rests. Two sets of lenses are provided, one for focusing and one for actual pick-up of the scene to be televised.

Figure 30 is a photograph of the same type of camera mounted on a camera "dolly." The camera is mounted on a counterbalanced arm which also provides a seat for the operator. The arm may be quickly and noiselessly raised or lowered by an assistant who moves the dolly from position to position. A telephone communication line keeps the cameraman in constant touch with the engineers in the control room. When the cameraman looks into the focusing lens he sees the inverted image of the scene before the camera as shown in Figure 31. Through this device he is able to accurately focus the scene on the iconoscope plate.

Television cameras are generally used in batteries and the various cameras are connected to the video signal channel by a mixer in the control room in a predetermined sequence. Figure 32 shows a scene in a television studio during the transmission of a program. You will note the presence of two iconoscope cameras and the sound pick-up microphone on a long boom which permits easy, quick movement of the microphone for suitable pick-up without interference with the television picture. The lighting arrangement is also evident. A television program consisting of a one-hour revue involves more than eight scene shifts and more than forty different camera positions.

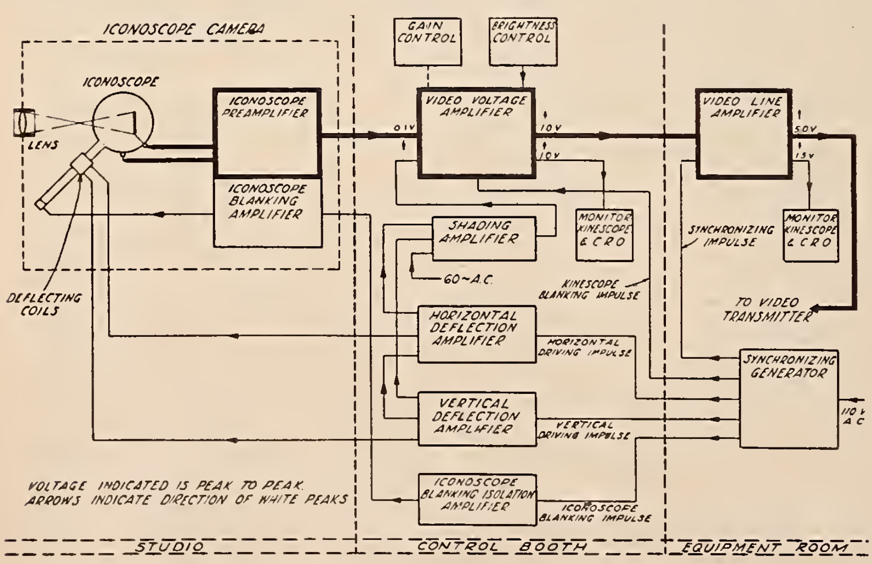


FIGURE 28. ***Diagram showing elements of one video channel***

The video signal generated in the iconoscope is fed into a pre-amplifier located right in the camera. The signal is thus amplified to a useful intensity so that it can be transmitted through a heavy cable to the video voltage amplifier in the control booth after passing through the mixer control.

The control room adjoins the studio and is at such an elevation that the operating engineers have a clear view of the studio scene. Both the sound and video signals are monitored in this room. The scenes are picked up by the iconoscope camera and reproduced on the two monitoring kinescopes. One monitor shows the scene being transmitted, and the other one shows the scene picked up by the second camera preparatory to transmission.

A close-up of a monitoring kinescope may be seen in Figure 33. The engineer in the control room can regulate the brilliance of the television image and connect and disconnect the camera from the channel by means of the controls at his fingertips. Another engineer seated beside him controls the sound from the studio. Both can communicate with the cameramen and microphone men by telephone. The racks of equipment behind the engineers include the video voltage amplifiers and the synchronizing and control equipment associated with each iconoscope camera.

Motion picture film material originates in a film studio. This studio consists of two rooms, in one of which are installed two special 35-mm motion picture pro-

FIGURE 30. *Iconoscope camera on camera dolly*

jectors and other supplementary equipment (Figure 16 in last month's instalment). and in the other room are two iconoscope cameras with video and monitoring and control apparatus (Figure 34). The motion pictures are projected through the port openings in the wall on to the iconoscope mosaics in the next room.

Film Studio Equipment

The equipment in the film studio control room includes two cameras, their video voltage amplifiers and associated synchronizing and control equipment, and audio equipment for the control of the sound from the film. The two iconoscope cameras are just visible at the extreme right of Figure 34 and are so mounted that they may be shifted from side to side for use with either of the film projectors in the adjacent room.

Average brightness and contrast (gain) of the picture are controlled in the video voltage amplifier. In addition, horizontal and vertical deflection systems are provided for both the iconoscopes and the monitoring kinescopes. Shading amplifiers and controls are also necessary to provide correcting adjustment of relative light values in the various areas of the picture.

In the description of the pick-up tubes it was mentioned that the electron beam is deflected both horizontally and vertically. For this purpose vacuum tube circuits provide a saw-toothed oscillating current (named thus because of their shape resemblance to the teeth of a saw) to the deflecting coils. There are two horizontal deflecting coils, one on either side of the tube, which are connected in series. There also are two vertical deflecting coils, one at the top and the other at the bottom, connected in series.

If a current is applied to the horizontal deflecting coils which increases steadily in intensity, the electron beam is made to uniformly move horizontally from left to right. It is most important that the motion from left to right be uniform in order to produce the proper light contrasts. It is still more important that the rate of motion be uniform in order to obtain correct distribution; that is, to prevent the flattening of a circle on one side, due to the slower motion of the scanning beam over that area of the picture.

However, the time required for the beam to return to the left side, to again scan the mosaic as it does in the iconoscope, is wasted time and should for practical purposes be reduced to a minimum. Thus, if the current can be quickly restored to a minimum, the beam can be made to sweep back to the left side much more quickly. A saw-toothed oscillating current can perform this feat. During the first part of the cycle (see upper portion of Figure 35) while the current increases steadily, the beam sweeps uniformly from left to right. Then, while the current drops to normal very sharply, the beam quickly sweeps back to the left side and is ready to scan again.

Present Standards

Present standards call for 525-line interlaced scanning at 30 frames per second. To accomplish this the beam is made to sweep horizontally from left to right 262½ times in 1/60 second, scanning every other line so to speak, and then 262½ times in the next 1/60 second, scanning those lines omitted the first time.

If there were no vertical force exerted, the beam would simply retrace itself at that rate. However, another saw-toothed current is applied to the vertical deflecting coils. This operates to move the beam downward slowly from top to bottom in 1/60 second. The horizontal and vertical deflecting currents operate simultaneously. The overall effect is, therefore, to cause the electron beam to move downward slightly while it is also moving from left to right and back. The return action, right to left, is so fast that it is almost horizontal. The lines are still, however, parallel but slope downward slightly.

When the beam reaches the lower right-hand corner, it is caused to return

FIGURE 31

FIGURE 32. *NBC television studio*

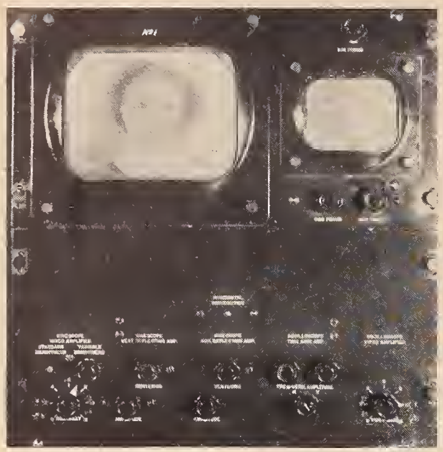


FIGURE 33

FIGURE 34. *Film studio control room*

to the upper left-hand corner very rapidly, using several horizontal lines in its course since the horizontal deflection continues right on, by the saw-toothed current dropping off sharply to normal as shown in the lower portion of Figure 35. Of course, the current for vertical deflection is of a much lower frequency than that for horizontal deflection. The former is 60 cycles per second, while the latter is 15,750 cycles per second. In both cases, the current increases steadily to a maximum and drops off sharply to normal, thus causing the useful motion or deflection of the beam to be at a uniform speed, and the return or flyback as rapid as possible.

Course of Deflected Beam

For a better understanding of the course of the deflected electron beam, a diagram has been prepared as shown in Figure 36. It should be understood that this simply represents the actual performance. The electron beam starts its cycle at 1 in the upper left corner. It moves across to 2 in its horizontal scanning, being moved downward slightly at the same time. It then returns quickly to 3 in a nearly horizontal line. Scanning again to the right to 4 and returning to 5, it continues this action for 262½ lines to 6, arriving there in 1/60 second. The vertical deflecting current has steadily increased to a maximum during the interval that the beam has travelled from 1 to 6. When the beam reaches 6 the vertical deflecting current rapidly drops off to normal, causing the beam to commence its flyback traveling to 7. At this point the horizontal deflection which goes right on causes it to move to the right but still upwards to 8. Again it moves to the left and upward, and so on, until it reaches 9 at the top, at which point the vertical deflection has reached normal and the current begins to increase again.

So the beam commences to scan the omitted lines, passing to 10, after which it quickly returns to 11, scans again to 12, returns to 13, and so on. When it reaches 14 at the lower right corner, the vertical deflection has reached maximum and again begins to drop off sharply so the beam is returned to the upper left corner, 1, rapidly using several horizontal lines on its way. The time for the beam to travel from 9 to 14 was also 1/60 second. Thus, it has been made to scan 262½ lines twice in a total period of 1/30 second.

The resolution of the iconoscope is considerably better than the rest of the system is capable of transmitting. For this reason it is possible to scan an area considerably smaller than the full size of the photosensitive plate before the resolution of the iconoscope becomes the limiting factor. Thus, unusual flexibility is offered.

After the video signal has been suitably adjusted and amplified to its proper intensity by the video voltage amplifier in the control room, it is sent to the video line amplifier for further amplification in the equipment room. The synchronizing generator is also located in this room.

It must be understood that the horizontal and vertical deflecting currents do not accompany the picture or video signal. They are simply controlling currents and are separately created at the transmitter and at each receiver to perform their functions. Therefore, some means must be established so that the deflecting currents in the receiver are synchronized with the deflecting currents in the transmitter.

In other words, the electron beams in the pick-up tube and reproducer tube must be made to start their scanning cycle at precisely the same instant and

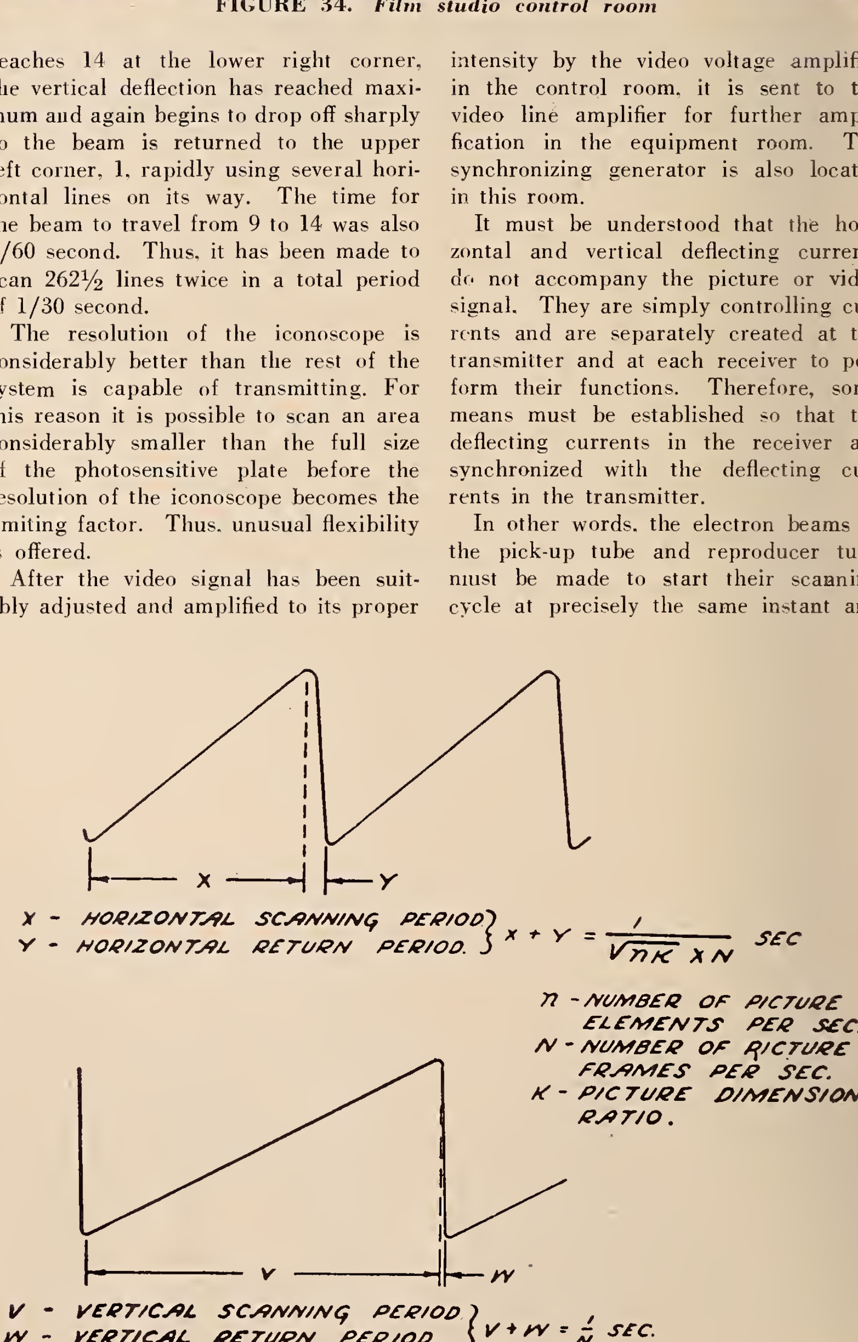


FIGURE 35. *Saw-tooth shape deflecting currents*

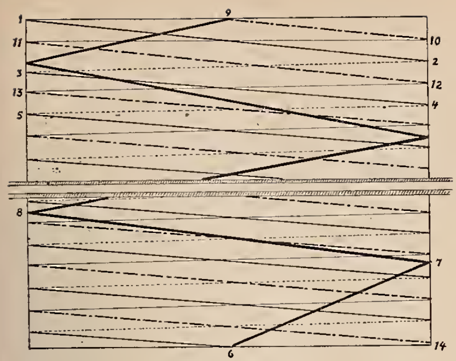


FIGURE 36
Course of electron beam in scanning 525-line picture interlaced

to keep exactly in step during their entire cycle in order that the reproduced image be similar to that of the original. For this reason synchronizing impulses are created and transmitted with the video signal. The synchronizing generator which creates these impulses consists of vacuum tube circuits of extremely complicated design.

The signal generated by the iconoscope is not only a function of illumination of the mosaic but also of the velocity of the scanning beam. Since the scanning beam is made to move at a uniform rate of speed a picture signal truly representative of the light values of the picture is created. However, the rate of return of the beam both horizontally and vertically is not uniform, and at that time undesirable signals are generated. These undesirable signals have an amplitude of several times the useful picture signal and must, of course, be removed.

The total signal generated has the general appearance of that shown in Figure 37 (a). The undesired signal generated during the reversal and return of the scanning beam is that portion which is rectangular in shape. To remove this portion of the signal a square wave shaped signal is introduced into the amplifier. The wave shape of this signal is illustrated in Figure 37 (b). The amplitude of the signal is such that the white parts of the undesired signal are shifted with respect to the axis to a point that corresponds to black, Figure 37 (c). The picture frequency amplifier is so arranged that this combined signal is of such a polarity and amplitude that the undesired signal swings the grid of an amplifier tube beyond cut-off. The result is a signal in which the amplitude of the blanked-out section is, for practical purposes, a constant with respect to the axis, as shown in Figure 37 (d).

Synchronizing impulses are added to the video signal to synchronize accurately the deflecting currents in the receiver with those in the transmitter. The blank-out section of the signal, as explained above, is of no use as far as the picture is concerned. It is a signal created during the scanning beam flyback period. To prevent interference between the picture signal and the synchronizing impulses, they are added at the blanked-out portions. The horizontal synchronizing impulse is thus added to the video signal during the time that the beam is flying back from right to left and the vertical synchronizing impulse during the time that the beam is flying back from the lower right corner to the upper left corner. These impulses are created with a greater amplitude than the picture signal so that they can be easily recognized and diverted by the receiver amplifiers.

Synchronizing Signals

Thus, the need for a wider transmission frequency band is avoided. The synchronizing impulses are mixed with the video or picture signal but do not distort the picture transmitted. These synchronizing signals are square-topped waves rising above the range of value assigned to the picture shading. The duration of the horizontal impulse is 5.08 micro-seconds and that for the vertical or framing signal is 190.5 micro-seconds.

The shape of the standard television signal is shown in Figure 38. From this it is easy to comprehend the shape of and the relative location of the synchronizing impulses. First of all, it should be clearly kept in mind that only the horizontal synchronizing impulse is

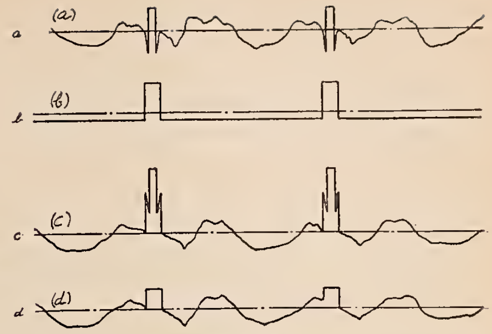


FIGURE 37
Video signal with blanked-out section

added to the blanked-out portion of the horizontal flyback period, but both horizontal and vertical synchronizing impulses are added to the much longer blanked-out portion of the vertical flyback period. The synchronizing impulses compare to the amplitude of the video signal and blanking in the order of 20/25% of the maximum video carrier. It is, therefore, really very easy for the selective circuits in the television receiver to separate the video from the synchronizing signals.

Referring to diagram *A* of Figure 38, the first portion shows the square topped horizontal synchronizing impulses between horizontal scanning line video signals. The distance *H* is the period of time from the start of one horizontal scanning line to the end of the respec-

(*Continued on page* 30)

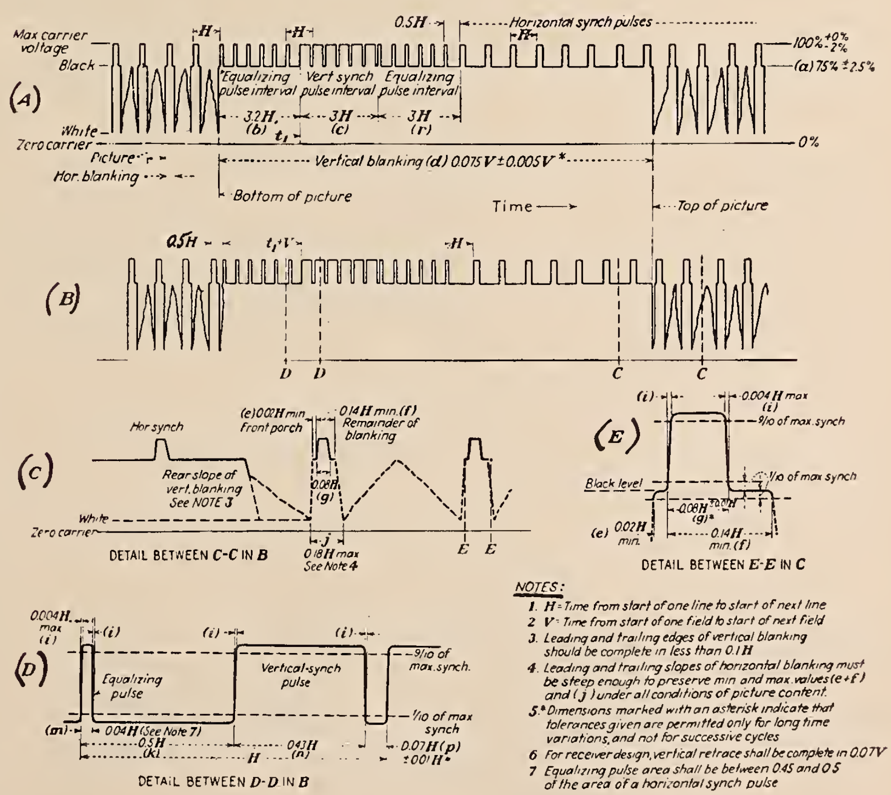


FIGURE 38. STANDARD TELEVISION SIGNAL
525-lines, 30 frames per second, 60 fields per second, interlaced

SMPE MEETING

(Continued from page 13)

ample of this experimental work.

The initial problem was to get pilots in the final stages of operational training or on combat duty to be willing to view slidefilms to which they were frankly allergic as a medium smacking too strongly of the traditional classroom.

Secondly, because of the complexity of the material to be presented, original treatment had to be devised to achieve a psychologic impact that would enable pilots to remember survival facts months after viewing the film. This treatment involved fresh approaches in script and art work, and the use of a color process new in the 35-mm commercial field.

ABC OF PHOTOGRAPHIC SOUND RECORDING

E. W. Kellogg

Radio Corporation of America

Suggestion has been made that a paper be prepared outlining the broad principles of photographic sound recording as practiced for motion pictures. If it is attempted to make such a paper deal with anything like adequacy with the many phases of this complex art, it would be nothing short of a book. However, it appears possible to present in reasonably brief space the essential principles of photographic sound recording systems and to supplement this by a bibliography which, though incomplete, will at least give the reader a start in studying up any special phases of the question. It is hoped that a brief paper of this type might serve a useful purpose in helping those who are suddenly confronted with the necessity of working in this field, to gain a preliminary picture of what is involved in photographic sound recording, so that they can, with less difficulty, read the papers which discuss the various special problems.

SOME TURBULATION CHARACTERISTICS OF NEW 20TH CENTURY-FOX DEVELOPING MACHINE

M. S. Leshing and T. M. Ingman

20th Century-Fox Film Co.

It was necessary to have a clear idea about a simple and practical means of measuring developing solution turbulation as an aid to the design and construction of a new developing machine at the Twentieth Century-Fox laboratory. Such a means was evolved by engineers at this laboratory. It is the purpose of this paper to describe this method of turbulation measurement, and the results of some preliminary tests made with both the new and old developing machines.

EFFECT OF FILAMENT LOCATION ON PROJECTION SCREEN UNIFORMITY

M. G. Townsley

Bell & Howell Company

Data are given on the effect of filament shift and filament rotation on the screen brightness and brightness uniformity in a high-efficiency 16-mm projection optical system. The data show that the filament locations and orientation is critical for maximum brightness and best uniformity. The precision illuminated testing projection equipment used in making these tests is described.

A RE-RECORDING CONSOLE, ASSOCIATED CIRCUITS AND CONSTANT B EQUALIZERS

H. R. KIMBALL

M-G-M Studios, Culver City, Calif.

A two-position console developed to handle multi-track re-recording requirements, using sliding volume controls and pre-set equalization with which the mixer has at his command combinations of equalizers which may be connected into the circuit upon cue as required.

A variable-type attenuation equalizer circuit arranged to give improved equalization characteristics as the control dial is varied from step to step.

METHOD FOR MEASURING STEADINESS OF MOTION PICTURE CAMERAS

M. G. Townsley

Bell & Howell Company

The unsteadiness of the film motion in a motion picture camera may be directly measured in terms of the maximum failure to return frames to identical register on successive passages of the film through the camera by photographing a ruled target during each of the successive passes and inclining the target before the second passage of the film through the camera. The amount of tilt and the line width depend on the focal length of the lens being used and the resolving power of the film.

AT YOUR SERVICE

(*Continued from page* 18)

tutions are advisable only as a temporary or emergency measure. Permanent use will result in trouble of one kind or another.—F. M. WALLS, *RCA.*

Checking Defective Tubes

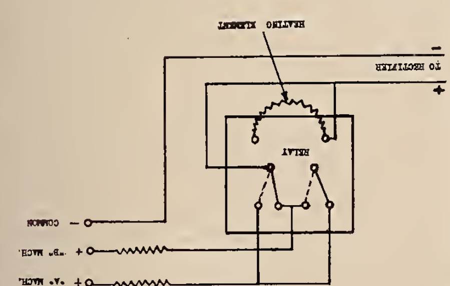
A good test for defective tubes is to place a 300-cycle loop in the machine and then change the line voltage tap from 115 to 125 volts, and from 105 to 115 volts. The change in output using a DB meter at the output of the system amplifier should be within ½ DB of a 4 DB change. If a tube is bad the output will change 6 or more DB.—C. H. ATCHISSON, *RCA.*

Reviewing Filter Capacitor Disconnect Modificatiou

While most projectionists handling sound equipment have at one time or another been instructed as to the rapid disconnect modification feature of filter capacitor circuits, it has been found that without exception all men handling such equipment have forgotten the procedure and the newcomers have never been instructed. A review of this function, and resultant meter readings upon failure and the procedure for emergency correction, may be in order in such situations if emergency calls are to be kept to a minimum—F. M. WALLS, *RCA.*

Pre-Heating Exciter Lamps from MI-1500 Power Units

Here is a simple and inexpensive method that I installed about eight months ago which has proved very effective. Instead of ordering a resistor which these days is expensive and very difficult to obtain, I went to the nearest hardware store and purchased for 25c a heating element used in the reflector type of electric heater. I cut the element to obtain



the desired resistance, and then removed the two lower mounting screws from the bottom section of the relay base and replaced them with two new and longer screws. These screws are used as binding posts to support the heating element that forms into the shape of a horseshoe. The negative side of the output from the relay was removed and connected common to both soundheads. The relay was wired "criss-cross" so as to operate as a reverse double-pole double-throw. The wiring diagram is shown above.—C. H. RUSH, Jr., *RCA.*

MOTIOGRAPH NAMES JOE CIFRE NEW ENGLAND DISTRIBUTOR

Joe Cifre, Inc., Boston theatre equipment and supply house, has been appointed exclusive dealer in the New England film territory for Motiograph, Chicago, manufacturers of Motiograph projectors and Microphonic sound systems.

Joe Cifre, president and treasurer of the organization, has been identified with show business since the days of "The Great Train Robbery," when he worked in the projection room of his father's and other theatres in Boston. He will also be remembered for having been road manager for the Camera-phone Talking Picture shows, back in 1912.

New Carbon Technique Hailed by Scophony

A new development in carbon technique by the National Carbon Company is announced by the Scophony Corporation of America as marking an "immense advance" toward making color television available on full-size screens in motion picture theatres installing the Scophony "Supersonic" television projectors, which, the announcement points out, are the only television projectors known to be able to use carbon arc lamps as a light source.

Arthur Levey, president of Scophony, declares that "this new technological advance brings immeasurably nearer the day when movie audiences will be able to fully appreciate the realism, clarity and life of color television as an added attraction supplementing the usual film programs of motion picture theatres." Mr. Levey congratulated the National Carbon Company scientists on their achievement and commended the enterprise and persistence of E. A. Williford, vice-president of National, under whose direction engineers and chemists considered Scophony's problem of extending its "Supersonic" method to color and succeeded in increasing the carbon crater intensity of brilliance by seven times normal standards to meet the necessary requirements for this method of color television.

Scophony's alternative approach to solving the problem of projecting full-size color television pictures by its Skiatron Electron Opacity System is based on the efficient subtractive three-color method which is utilized in all successful process of color cinematrography such as Technicolor and Kodachrome. "This new color television development," states Mr. Levey, "should help clear the way for the swiftest possible reconversion of the television industry to peace as engineers and materials become available, thus creating thousands of jobs for returning servicemen."

HEAVY POST-WAR EQUIPMENT DEMANDS SEEN

W. E. Green, president of National Theatre Supply Co., which has completed a nation-wide survey of post-war theatre needs, said that "we found no theatres in which at least one equipment item was not urgently needed just as quickly as war-time restrictions are lifted and it becomes available."

The company was amazed, according to Mr. Green, "in our talks with exhibitors, to find so many planning to break ground for new theatres. Sites have been selected and purchased, plans drawn, and showmen await only the green light to start building. This theatre planning includes not only the latest type of streamlined theatre structures, but also one or more outdoor drive-in theatres in many good sized cities and towns.

"Now that exhibitors have told us what they will need in the post-war period, we are arranging our manufacturing and delivery schedules to enable us to provide all the equipment they want with the least possible delay when peace-time production is resumed."

GENERAL PRECISION REPORTS NET GAIN OF $1,255,907 FOR 1943

General Precision Equipment Corp., in its annual report for 1943, shows consolidated net income amounting to $1,255,907.23 after the deduction of federal income taxes in the amount of $3,039,360. Such net income was equivalent to approximately $2.14 per share, as compared with $2.16 in 1942. Dividends of $1 per share were paid by the corporation during the year, amounting to $585,942, and the net addition to consolidated earned surplus was $699,965.23.

The corporation, during the year, also acquired a minority stock interest in Panoramic Radio Corp., which is engaged in the business of supplying certain equipment of advanced design to army services, and a comprehensive patent license from Panoramic Labs. National Theatre Supply Company and Bludworth, Inc., were merged during the year under the name of National-Simplex-Bludworth, Inc., the financial statement further notes.

Effect of Movies On the Eyesight

By *LOGAN CLENDENING, M.D.*

PARENTS and teachers who deplore the effect of the movies on the eyes of young children, should save their breath. If the children knew enough, they could turn on the teachers and show that it has been proved the movies put less strain on the eyes than reading. In fact, if the movies ever try to develop their possibilities in the field of education, they might almost make reading a lost art. It would certainly be an almost painless method of education.

The question was thoroughly investigated by a committee of the League of Nations in 1930, at a time when, if memory serves, the technical difficulties of projection had not been entirely overcome and the flicker was more pronounced than with present apparatus.

The cinema as such has no deleterious influence on the sight of healthy persons from the standpoint of either eyes or nerves. Neurophathics and persons of weak sight may experience ill effects owing to the phenomenon of intermittence (caused either by the worn-out state of the apparatus, or the film, or to the speed with which the films are turned), or to startling changes of light that tire the eyes in following the movements of a jerky and abnormal rhythm.

Generally speaking, it would be desirable in the case of children and young people: (a) to have daylight or subdued light screens; (b) to arrange programs so that longer and shorter scenes should be alternated. Save in exceptional instances, programs might include: one theatrical film divided into parts not excessively long; one short cultural or scientific film, and one topical film. This allows for the necessary brain rest produced by variations of impressions.

The Committee sent out thousands of questionnaires to children and young people. About 70 per cent of the replies indicated that the eyes did not feel tired or strained after watching a film program. About 25 per cent said they did feel tired, and about 5 per cent said they felt tired sometimes.

Dr. Park Lewis, when vice-president of the National Society for the Prevention of Blindness, stated that watching a film entailed less strain than reading a book for a corresponding period of time.

"Since viewing moving pictures is distant vision, it does not demand so great an ocular effort as near vision. When eyestrain is caused by moving pictures, it is due to one or another preventable condition, such as too prolonged fixing of attention on a single point, or defective vision, faulty projection, or to improper illumination."

WALTERS HEADS NATIONAL'S NEW DRIVE-IN THEATRE DIVISION

W. E. Green, president of National Theatre Supply, in anticipating the need to serve the greatly increased drive-in theatre business which is expected in the post-war period, announces that L. H. Walters, manager of the company's Cleveland office, will head the newly formed drive-in theatre equipment department of the organization.

Mr. Walters is a veteran of the theatre equipment business, having entered the field thirty-four years ago. Since joining National in 1926 he has acted as sales representative in the Southern Illinois and Kentucky territory and has been manager of the Cleveland branch since 1935. He is a specialist in projection, was among the pioneers in the development of the drive-in theatre idea, and has personally supervised the installation of equipment in many of the country's leading outdoor theatres from coast to coast. He will act as a consultant to exhibitors planning post-war drive-in theatres.

ALTEC RENEWS SERVICE CONTRACTS

Altec Service Corporation, through H. B. Moog, its district manager for the southeast, announces the signing of contracts for the continuing of service and supply of parts for the 70 theatres of the Malco Circuit. The company also announces that the Schine Circuit, Gloversville, N. Y., has signed a new contract for service and parts for their chain of theatres.

M. P. FILM REGULATIONS

(*Continued from page* 14)

asbestos board or sheet iron, not exceeding 75 pounds (15.000 feet of 35 mm film);

(4) In a special room constructed and vented as required for rewinding rooms (see sub-section 212), when approved by the inspection department having jurisdiction, not exceeding 125 pounds may be kept in lieu of the amount permitted in either the projection room or the rewind room. The total quantity in the three rooms shall not exceed 250 pounds (50,000 feet of 35 mm film).

(b) The above quantities of film shall be kept as follows:

(1) Up to 40 pounds (8,000 feet of 35 mm film) of film may be kept in Interstate Commerce Commission shipping containers, or approved cabinet in each room;

(2) If the amount of film on hand exceeds 40 pounds, an approved cabinet shall be provided, in which the amount of film in excess of 40 pounds shall be kept.

214. No collodion, amyl acetate or other similar flammable cement or liquid in quantities greater than 1 pint shall be kept in the projection booth or room or rewind room.

215. Splices in film shall be made on mechanical cutting and splicing machines. See paragraph 212(a) on handling of scrap film.

216. *Location.*—The number and location of motion picture projection rooms or booths in any non-sprinklered building shall be subject to the approval of the inspection department having jurisdiction.

217. *Operation.*—Motion picture projectors shall be operated by and be in charge of qualified projectionists, who shall not be minors.

218. *Procedure in Case of Fire.*—In the event of film fire in a projector or elsewhere in a projection or rewind room, the projectionist should immediately shut down the projection machine and arc lamps, operate the shutter release at the nearest point to him, turn on the auditorium lights, leave the projection room, and notify the manager of the theatre or building.

NOTE: It is the intent of the regulations to permit the use of 2,000-foot rolls of 35-mm film in theatres and exchanges only, when handled and stored as prescribed. The limitations on quantities permitted are based on weight.

Film Exchanges

221. *Sprinkler Protection.*—Buildings not of fireproof construction, housing an exchange, shall be completely equipped with automatic sprinklers. Buildings of fireproof construction shall be eqiupped from and including the lowest floor on which film is handled to the top of the building with an approved automatic sprinkler system. It is recommended that the sprinkler system extend throughout the building.

222. Exchanges shall be provided with one or more independent rooms to be used exclusively for receiving and delivering film, and also one or more separate rooms for the purpose of inspecting, examining and repairing film, and one or more rooms for the storage of posters or other combustible materials.

223. *Shipping Room.*—One or more vaults or cabinets shall be provided in connection with the receiving and shipping room of exchanges into which all film shall be placed and kept except during such time as is necessary for checking, sorting and shipping. All film outside the vaults and cabinets, except while actually being handled, shall be kept in I.C.C. containers.

NOTE: With the enforcement of the above general principles of operation, the total quantity of film, including that which is in I.C.C. containers, in the receiving and shipping room of any exchange should ordinarily not exceed 100 to 150 standard rolls or 50 to 75 double rolls, with a maximum limit, which should never be exceedeo. of 300 standard rolls or 150 double rolls or 1,500 pounds.

224. *Quantity of Film.*—In inspection, projection, rewinding and other rooms (not including shipping room) there shall not be in excess of 16 standard rolls or 8 double rolls for each person handling film in such rooms, of which not in excess of 2 standard rolls or one double roll for each person shall be exposed outside of closed containers. All film in excess

of this quantity shall be kept in cabinets or vaults.

Film Laboratories

231. All buildings used for, or housing a motion picture film laboratory shall be equipped throughout with automatic sprinklers.

232. *Quantity of Film.*—In all the various work rooms in which film is handled (not including shipping rooms) the quantity of film not in containers shall not exceed two standard rolls per person handling film; this should not be construed, however, as restricting the quantity of film which may be in process on printing, developing or drying machines to two standard rolls. There shall not be more than 10 standard rolls of film not in approved cabinets for each person working in such rooms; provided, however, that in developing rooms there shall not be more than 20 standard rolls of film not in approved cabinets for each developing unit. All film in excess of the above quantities shall be kept in cabinets or vaults.

233. *Printing.*—On all future installations, unless printing machines are so spaced that the distance from the film on any machine to that on any other machine is at least 6 feet, they shall be separated from each other by incombustible partitions of 3/8-inch hard asbestos board or its equivalent in heat insulation and durability, and extending from the floor to at least 3 feet above the top of the film on the machines. If partitions carried to this height would extend higher than 2 feet below sprinkler deflectors, they shall be built up to the ceiling. If partitions are extended to the ceiling one sprinkler head shall be located in each of the sections thus formed. In any event, sprinklers shall be so arranged that not more than two machines are dependent upon the protection afforded by any one head.

234. *Drying.*—Drying machines of the cabinet type shall be of metal and wired glass. Heating units shall be located outside the cabinet, and shall be provided with thermostatic control so that the temperature in the cabinet shall not exceed 120° F.

235. *Waxing.*—Waxing film shall be done in a separate room. Waxing processes which require the waxed film to be left exposed to dry shall be in a room used for no other purpose and not over 5 such machines shall be located in one room. Not over 25 standard rolls or 25,000 feet of film shall be exposed at one time.

236. *Projectors.*—Not more than 5 motion picture projectors shall be located in one room, unless the projectors are of a type using incandescent electric lights of not over 25 watt size when not more than 10 projectors shall be located in one room.

(*To be continued*)

TELEVISION TODAY

(*Continued from page 23*)

tive flyback or 1/15750 second. The beginning of the vertical flyback period is clearly shown commencing at the point marked "Bottom of picture" and extending to "Top of picture." It occupies a time period of from 7/6000 second to 8/6000 second.

During this vertical flyback period three types of synchronizing impulses are added to the video signal. First, there are some "equalizing impulses" for a period of 32/15750 second. These help to separate the horizontal and the vertical impulses and assist the selective circuits in the television receiver to properly perform their function. Then comes the "vertical synchronizing impulses" for 3/15750 second, which is followed by more "equalizing impulses" for another 3/15750 second. "Horizontal synchronizing impulses" then follow for the balance of the period. Diagrams *C* and *D* show close-ups of certain portions of these signals to indicate their shape and size.

It should be remembered that these synchronizing impulses simply keep the vacuum tube oscillators in the television receiver which create the saw-toothed horizontal and vertical deflection currents in synchronism with those in the transmitter.

After the video signal has been suitably amplified by the video line amplifier and the blanking and synchronizing signals added, it is transmitted from Radio City to the Empire State Building.

The video and audio transmitters installed in the Empire State Building are entirely separate, and are especially designed for high power operation on ultrahigh frequencies. The modulator of the video transmitter is capable of handling the wide side-bands required for the video frequencies. Each transmitter has a separate transmission line and antenna system. The antennas are arranged to produce minimum mutual coupling. Both antennas yield horizontally polarized waves with a field pattern which is essentially circular in the Empire State Building, having an approximate height of 1250 feet, provides a location from which a maximum transmitting range may be obtained. The distance from the antenna to the horizon is approximately 43 miles.

Facilities are also available for the pick-up of television scenes remotely through a mobile television station as shown in Figure 39. These may be used to pick-up outdoor or remote news events and the like. The two large motor vans are connected by coaxial cable when in operation, and contain complete apparatus for picture pick-up with accompanying sound. One, mounting the pick-up apparatus, provides operating positions on the roof for iconoscope cameras and special parabolic microphones. The other, the transmitter, has a special "trolley" antenna which may be used to relay the broadcasts to Radio City.

FIGURE 39. *Television station on wheels*

We have thus followed the course of the minute video signal generated by the pick-up tube in the television studio all the way through the various amplifying and control circuits. We have seen the addition of blanking and synchronizing impulses, examined some of the controlling circuits for deflecting and shading, and then pursued the final video signal to the transmitter where, with its accompanying sound, it is made to modulate the antenna currents for transmission as radio waves through space to the horizon.

RCA PERSONALITIES IN THE NEWS

Homer B. Snook, sales manager of the Photophone Section of RCA, and Adolph Goodman, assistant manager of the RCA Service Company, Inc., left company headquarters in Camden, N. J., recently for a round of visits in the Middle West. Snook planned to call on theatre equipment dealers and theatre circuit officials in the Cincinnati, Chicago, and Denver areas. Goodman will visit motion picture exhibitors in the Chicago, Denver, and Salt Lake City regions, following a meeting with Cleveland, Kansas City, and Chicago district managers of the RCA Service Company in Chicago.

• • •

Edward C. Cahill, president of the RCA Service Company, Inc., and W. L. Jones, vice-president, have returned to the company's Camden, N. J., headquarters following business conferences with motion picture exhibitors in the Chicago District.

• • •

B. F. (Ben) Biben, well known to theatre men in Philadelphia and vicinity, where he has been in charge of service sales for the RCA Service Company, Inc., has been placed in charge of service sales for the company's entire Philadelphia district. Announcing the appointment, W. L. Jones, vice-president, revealed that Biben's enlarged territory includes Eastern Pennsylvania, Southern New Jersey, Delaware, Maryland, and Virginia. Biben is a member of Variety Club's Tent 13, Philadelphia and the Motion Picture Associates.

• • •

B. D. (Dex) Streeter, formerly of the International Sales Department of RCA Victor, has been transferred to the sales staff of the company's Photophone Section.

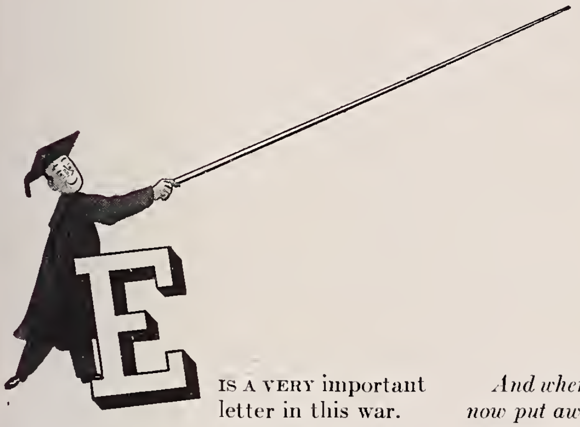
• • •

John F. O'Brien, assistant sales manager of RCA Victor's Photophone Section, has just returned from trade visits in Pittsburgh, Buffalo, and New York City. RCA theatre equipment dealers visited were A. R. Morrone, Superior Motion Picture Supply Company, Pittsburgh; William Linden, United Projector Supply Company, Buffalo: and Ben Perse, Capitol Motion Picture Theatre Supply Company, New York.

• • •

John Lierley, product manager of the Hollywood (Calif.) plant of RCA Victor, is returning to the West Coast this week after a three-week visit in the East on company business. Lierley divided his time between RCA Victor headquarters in Camden, N. J., the company's tube plant in Harrison, N. J., and the RCA Laboratories in Princeton, N. J., stopping off at the Indianapolis plant on his way back to Hollywood.

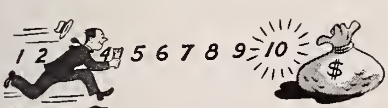
Some ABC stuff about E



E IS A VERY important letter in this war.

It's the name of the War Bonds you buy—"War Savings Bond Series E."

As you know, a Series E Bond will work for you for ten full years, piling up interest all that time, till finally you'll get four dollars back for every three you put up. Pretty nice.



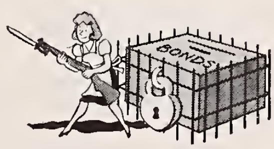
The first job of the money you put into "E" is, of course, to help finance the war. But it also gives you a wonderful way to save money.

And when the war is over, that money you now put away can do another job, can help America swing over from war to peace.

There'll come a day when you'll bless these Bonds—when they may help you over a tough spot.

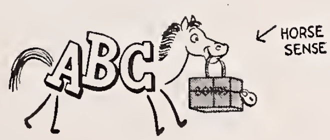
That's why you should make up your mind to hang on to every Bond you buy. You can, of course, cash in your Bonds any time after you've held them for 60 days. You get all your money back, and, after one year, all your money plus interest.

But when you cash in a Bond, you end its life before its full job is done. You don't give it its chance to help you and



the country in the years that lie ahead. You kill off its $4-for-every-$3 earning power.

All of which it's good to remember when you might be tempted to cash in some of your War Bonds. They are yours, to do what you want with.



But . . . it's ABC sense that . . .

They'll do the best job for you and for America if you let them reach the full flower of maturity!

WAR BONDS to Have and to Hold

The Treasury Department acknowledges with appreciation the publication of this message by

INTERNATIONAL PROJECTIONIST

This is No. 5 of a series

The Opera, Havana, Cuba

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the show must go on, because the march to Victory *must* go forward!

On this isle of democracy, solidly aligned with her sister republics of Pan America in the common fight for freedom, some 400 motion picture theatres are contributing, through their screens, visually and valuably to the ultimate triumph.

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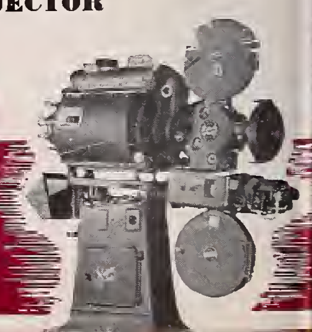


INTERNATIONAL PROJECTIONIST

MAY 1944

VOLUME 19 • NUMBER 5

25c A COPY • $2 A YEAR

TO PROJECTIONISTS!

Visitron cells are available for every type of sound projection equipment. Theatre supply dealers can advise the correct cell for your equipment. Buy from your supply dealer. If you wish to have your old cells tested without charge, write to G-M Laboratories, Inc., for instructions for shipping. Information furnished promptly.

TODAY, AS YESTERDAY

Brilliant

STILL A BRILLIANT FILM, audiences and critics agree, is Columbia's "Lost Horizon." Still brilliant, too, is the screen lighting from "National" Projector Carbons, whether the picture be the most recent release or a second or third run. Audiences enjoy virtually the same screen light today as when "Lost Horizon" was first shown.

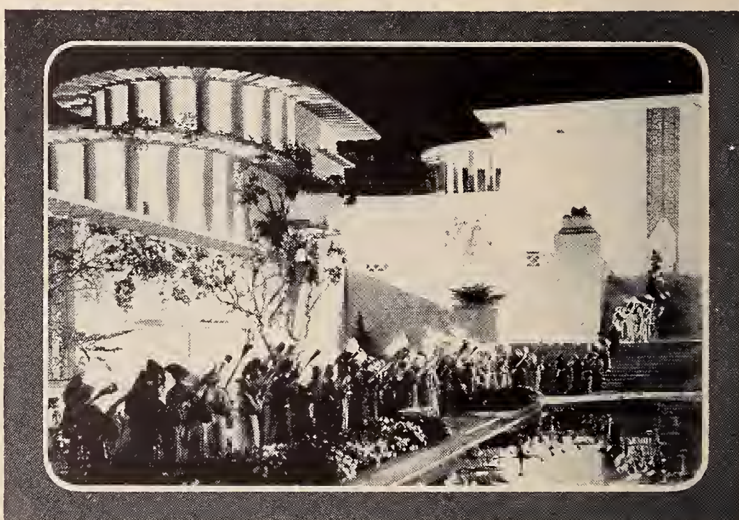
This has been accomplished because National Carbon Company's background of research and manufacturing experience enabled it to redesign pre-war carbons promptly to war-time needs . . . and also because of the close technical cooperation of exhibitor, projectionist and lamp manufacturer.

***Most important of all, however, is that enormous quantities of copper have been saved for the war effort,* through recovery of copper drippings and stripping of copper from carbon stubs.**

The best evidence that these efforts are successful is that motion picture patrons in ever increasing numbers, are overflowing theatres everywhere for needed relaxation and worthwhile entertainment.

★ *BUY UNITED STATES WAR BONDS* ★

1937



1944

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NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

CARBON PRODUCTS DIVISION, Cleveland 1, Ohio — UCC — New York, Pittsburgh, Chicago, San Francisco

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

DUE to war exigencies attendance at the annual convention of I.A.T.S.E., to be held in St. Louis, at the Jefferson Hotel, during the week of May 29 will make no record. But that is well and good in line with the war effort. The Office of Defense Transportation long has discouraged unnecessary travel, and it is to be hoped that all excepting delegates will heed requests of Alliance officers that only duly elected delegates make the trip. And, as well, that families of these delegates remain at home this year. Convention details will be printed in the June issue of INTERNATIONAL PROJECTIONIST, together with full reports on the various district meetings which are scheduled to precede the national gathering.

• • •

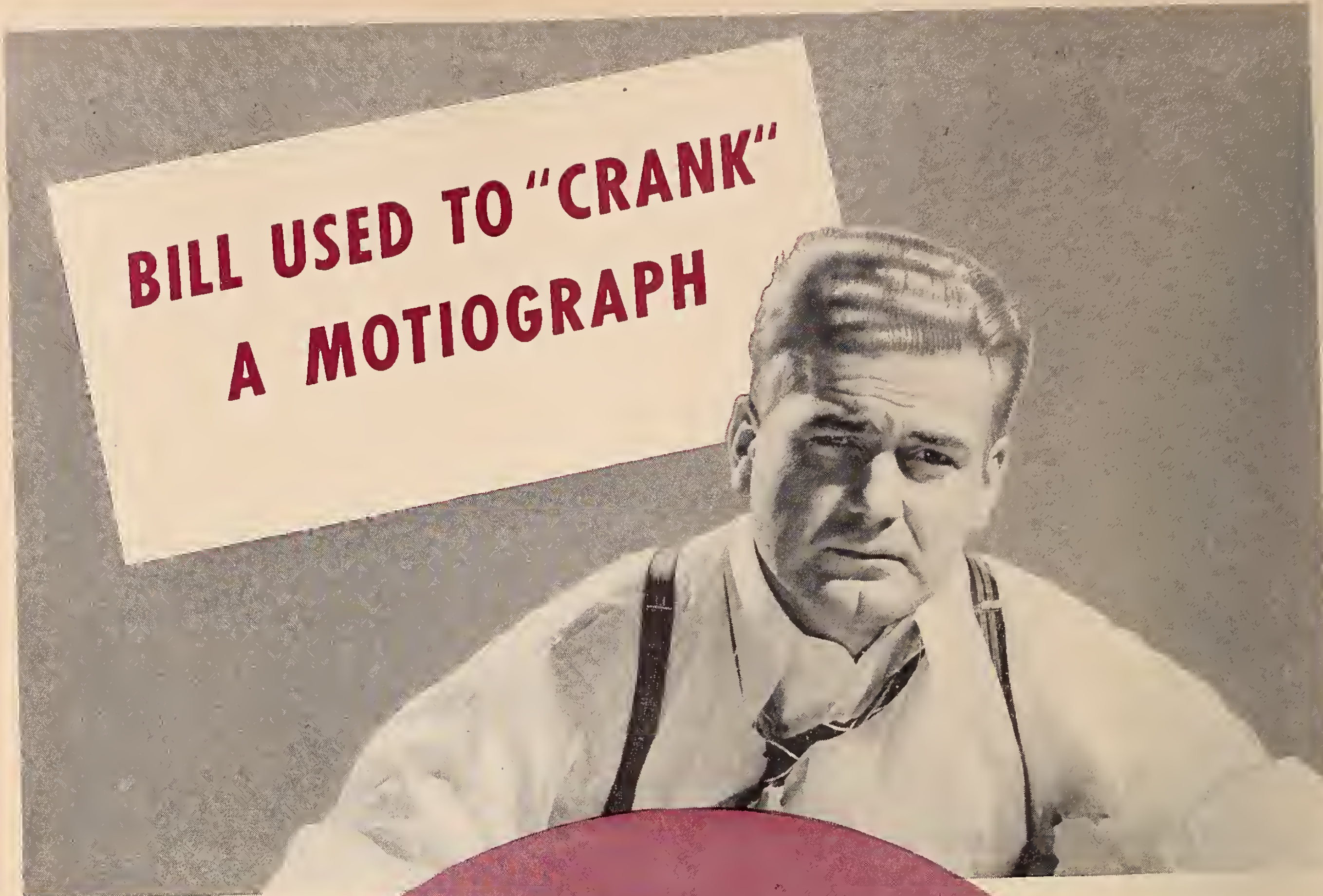
Interest is being focused on the drive-in theatre now to a greater extent than at any previous time. The fact undoubtedly is due to ideas held that the war is approaching its end, which will bring about a lifting of restrictions on new construction. Theatre operators, before the war, had shown a healthy interest in the growing popularity of drive-in theatres, but any plans for expansion naturally had to be submerged when the war agencies stepped into the picture and banned or curtailed many activities. While drive-ins have been in existence for many years, they are relatively few in number and far between as compared with the thousands of indoor houses. A new era, however, certainly is dawning, with technicians today working avidly on plans and equipment that practically assures a very large expansion in that field once the European and Asiatic brigands are bested by the United Nations.

• • •

Television still is toddling, but it is on the way to open new doors in the entertainment and educational worlds. Projectionists, in their perches, figuratively will be in on the ground floor of the coming new order. I.P., in the interest of the industry, has pioneered in disseminating up-to-date information on the art, and believes that projectionists who now are preparing themselves through educational reading of developments will occupy top posts when the curtain is lifted and the television takes its important war-postponed place on the silver screen.

• • •

On June 12 the Fifth War Loan will open officially. The goal will be $16,000,000,000, of which $6,000,000,000 will be sought from individual investors. The figures are impressive, but patriotism, too, is impressive. The issue must be over-subscribed. It only can be over-subscribed if everyone realizes his patriotic duty.



"It was shortly after the turn of the century that I first became acquainted with Motiograph projectors. In fact, it was the Model 1-A that I met up with, really the first high-grade projector that theatres could buy. My guess is that it could give a good account of itself even today.

"I cranked thousands of reels through that machine and the models that followed. Those projectors never whimpered and never fell down on the job. To me a Motiograph means keeping a picture on the screen, and that's the important thing to any manager or projectionist. We always parted reluctantly with every old Motiograph taken in trade on a new model. The ones we took out were always as good as new. The only reason for making the change was that the newer models had so many more improvements on them.

"Well do I remember the Model D, our first projector with a double shutter. What an improvement it was! Then in 1916 we bought the Model E and in 1921 the Model F. We wouldn't change from Motiograph for anything. When sound came in we ordered the Model H, and, in 1935, the Model HU.

"Today I've got two of the sweetest projectors ever built. They're Model K, and you know what that means. But I understand that even this job is to be topped shortly; that Motiograph is to have a brand-new post-war projector that will have more improvements on it than any projector since 1896, and a Mirrophonic sound system that will give a more natural and life-like performance than any we've ever heard. That's saying a lot, but if Motiograph says it's so, well it's so.

"There's just one fellow I'd like to meet up with and that's the bird who says he ever wore out a Motiograph or that one ever gave him any trouble."

To all of which we say, "*Amen!*"

"Since 1896" MOTIOGRAPH 4431 W. LAKE ST. CHICAGO 24, ILL.

"HASTEN THE RETURN OF PEACE
—BUY MORE WAR BONDS NOW!"

INTERNATIONAL PROJECTIONIST

VOLUME XIX MAY 1944 NUMBER 5

Simplifying Analysis of Amplifier Circuits

By *LEROY CHADBOURNE*

In order to read schematic diagrams of electrical apparatus, one must be able to recognize the conventional symbols for condensers, resistors, tubes and so on. In this article the author explains that the task of studying such diagrams is greatly simplified if the reader learns to recognize the meaning of combinations of such symbols, and studies them as a group rather than one by one. Twelve of the most common combinations are illustrated, and analyzed as groups, rather than as individual parts.

IN READING the diagrams of amplifier circuits it is very helpful to be able to recognize the meaning of *groups* of symbols. Studying a diagram in this way saves a great deal of time, and makes it unnecessary to trace certain individual connections. This may be compared to the advantage of being able to read words, rather than having to spell out each word letter by letter.

The accompanying diagrams represent groups of symbols that are commonly found in amplifier circuits. Each group has a definite meaning and can be read as a group without detailed study of the individual "letters," so to speak, that make it up.

For example, Figure 1 consists of three symbols—two condensers and one inductance. Each of these symbols may be regarded as one "letter." The three together, in this combination, spell "filter." Figure 1 is the symbol of an electrical filter—a symbol made up of three simpler symbols. These, however, should not have to be studied or traced one by one. The combination, as such, should be recognized for what it is.

Of course, there are a number of other types of filters, which are diagrammed differently. Increasingly common in modern amplifiers is the substitution of a resistor for the inductance of Figure 1. In such cases adequate filtering is obtained by using condensers of much larger capacitance. Again, either of the two condensers of Figure 1 may be omitted. As it stands, Figure 1 represents a condenser input filter; but if the condenser nearest to the source of power were eliminated, the drawing would be that of a choke input filter. Or, one additional inductance and condenser might be added, creating a two-stage filter. And other variations may be found in some circuit drawings.

Each of the accompanying figures represents a specific electric device or circuit, or part of a device or circuit, and is made up of common symbols connected in some specific way. Each one is subject to small variations of detail, which variations, however, will not make it unrecognizable. By learning to look for these combinations in amplifier diagrams the reader will enormously simplify the work of tracing through such a diagram; and will be able to trace through it far more quickly. He will be reading whole words, not spelling them out letter by letter.

The lower resistor and the condenser in Figure 2, when combined in the plate circuit of a tube in the manner shown, represent an R-C filter—that is, resistor-condenser filter. The purpose of this device is to keep the plate current's speech component from flowing back to complete its circuit through the source of plate power supply. The inductance of Figure 1 will be in series with the plate of Figure 2. If fluctuations in the plate currents of the different tubes are allowed to flow through the inductance of Figure 1, the d.c. output drawn from that inductance will contain those fluctuations. But that output commonly supplies the plates of all the tubes in the amplifier. If it carries the fluctuations of the plate current of the high power output tubes back to the plates of the low power input tubes, the effect will be to feed back the output speech voltage to the input stages. Such feedback makes an amplifier unstable, and may cause it to "spill over" and howl.

The condenser of Figure 2 provides the speech fluctuations in the plate current of that tube with a direct path back toward their source, and the lower resistor further encourages them to take that path instead of flowing down through the common *B* supply. In short, the combination is a filter, serving to keep speech fluctuations out of the *B* circuits, and it is called a resistance-condenser filter, or R-C filter. It will be found associated with the plate circuits of most if not all tubes in any

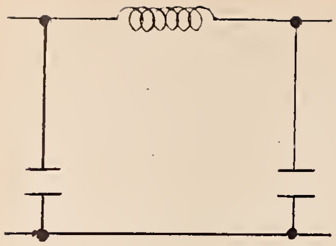


FIGURE 1

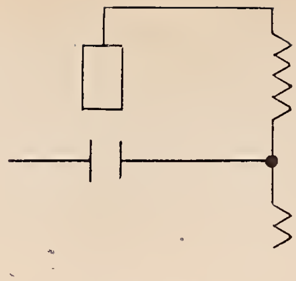


FIGURE 2

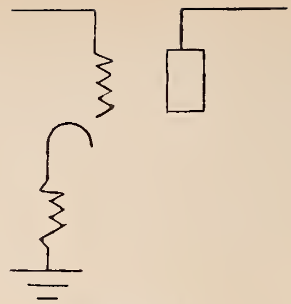


FIGURE 3

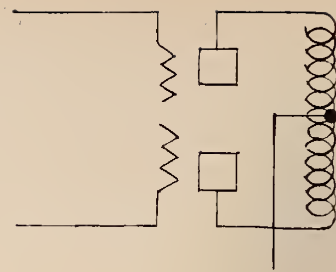


FIGURE 4

amplifier, and should readily be recognized for what it is. If the combination as drawn in Figure 2 is not found immediately, look for its equivalent along the plate circuit to each tube. The combination or its electrical equivalent will almost certainly be present.

Grid Bias Supply

The resistor of Figure 3 is another device that will almost certainly be found in any modern amplifier; and in most cases will be found drawn almost exactly as in Figure 3. Current flows through this resistor in such direction that the upper end is positive. The cathode of the tube is connected to the positive end of the resistor. Now, if the grid is connected to the lower end of the resistor, the grid will be biased negatively with respect to cathode. The grid connection is not shown in Figure 3, but where this bias resistor is in the circuit as shown, there will also be a grid connection to ground of some kind to complete the bias circuit. Also, there usually is a condenser connected directly in parallel to the Figure 3 resistor.

Occasionally, especially in the case of filament-type tubes, the combination of Figure 3 will present a superficially different appearance, although electrically the arrangement will have a similar effect. In that case it may be necessary connect to loudspeakers or to a loudspeaker filter network.

Figure 4, of course, represents a pushpull stage of amplification, and should be recognized as such at a glance. Even though it may be drawn a little differently, the essential facts are always easily recognizable: the plates of two tubes connect to opposite ends of the same transformer winding, and that winding usually has a center top—for connection to the source of plate current.

There are amplifiers in which every stage is pushpull from input to output, but the majority are "single-end" most of the way and push-pull only in their output stage. Where an amplifier contains both single end and pushpull stages, the arrangement of Figure 4 promptly brings up a definite question—how is the pushpull speech supply obtained? This is answered by looking at the grid leads. Either they go to the opposite ends of the secondary winding of a coupling transformer, or the projectionist knows at once there must be a phase-inverter tube in that amplifier, and he proceeds to look for it.

In almost all cases the phase inverter tube will be the one that supplies speech current to the *lower* grid of the pushpull pair; there is no particular reason for this, but it seems it has become almost a along the speech connection to the lower grid.

Figure 5 is merely an output transformer, the only special point about it being the connection that runs up and left from the secondary winding. Usually an output transformer is drawn at the right hand end of the amplifier circuit—another convention that almost all draftsmen seem to follow—so that the extra connection of Figure 5 runs back toward the input circuits of the amplifier. Now when you see that, more or less in the way it is drawn in Figure 5, it is almost certain to mean inverse feedback, and the extra connection can be traced to the inverse feedback circuit.

Parallel Plate Feed

There are other ways of getting inverse feedback from the output circuits of an amplifier, and in fact Figure 5 is incomplete in that the circuit should also involve a ground connection to the transformer secondary, perhaps through the lower right-hand terminal or the loudspeaker network. But the point at the moment is—when a wire branches from an amplifier output circuit and runs toward the input circuits, look along that line for inverse feedback.

Another output circuit variation, in which the pushpull output transformer primary does not have a center tap, will

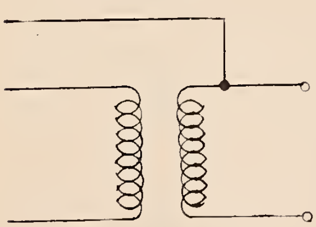


FIGURE 5

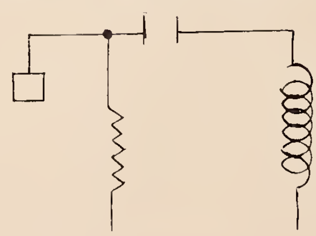


FIGURE 6

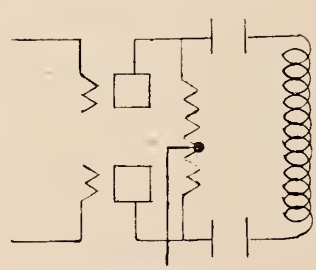


FIGURE 7

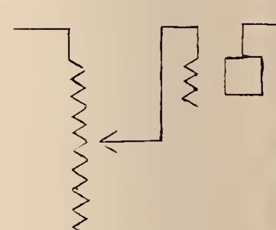


FIGURE 8

to trace the cathode line or the filament line to hunt out the electrical equivalent of Figure 3. If the reader understands clearly that that is what he is looking for he will find it, and recognize it, much more quickly.

Figures 4 and 5 relate to certain output circuit details—the terminals at the right of Figure 5 may be assumed to standard convention that all draftsmen follow. If the reader sees an arrangement like that of Figure 4 he knows at once what it is; if the grids connect to a coupling transformer he knows there is no phase inverter stage in the amplifier; if they do not so connect he knows there is a phase inverter tube and he finds it without trouble by tracing back be described further on in connection with Figure 7.

The arrangement of Figure 6 is another of those combinations that should not have to be puzzled out in detail because it represents a definite and well-known arrangement that can be recognized at a glance. It is an arrangement used with transformer coupling when the designer does not want to put the trans-

former winding in series with the plate supply to the tube. If the resistor and condenser of Figure 6 were eliminated and plate current supplied through the transformer, the transformer coil would be carrying a comparatively heavy load of d.c. and its core would have to be designed accordingly, or it might become "saturated."

Certain advantages in connection with the transformer can be obtained if the plate d.c. can be kept out of it; and that is done in Figure 6. where d.c. is applied to the plate through the resistor. The ripple or speech component in the tube's plate current it coupled to the transformer primary through the condenser, which of course blocks smooth d.c. entirely. Thus plate current is fed in parallel to the speech circuit, and not in series with it, and the arrangement, called parallel plate feed, makes possible a smaller and more economical transformer with the same sound quality.

Figure 7 is pushpull circuit with parallel plate feed; and it will be noted that, unlike Figure 4, Figure 7 shows no center tap to the output transformer primary winding. Plate current is not supplied through the transformer. If a center tap is provided, it will return to ground; and this is a point to watch for.

Variable Control Circuits

Figure 8 shows a volume control. It is the type generally used in amplifiers of recent make, and it is practically unmistakable in a diagram. Nine times out of ten, if the projectionist is looking through an amplifier circuit diagram for the volume control, he need only look for the arrangement of Figure 8. If he is going through a diagram for other reasons and comes upon that arrangement —he knows at once that's the volume control of the amplifier.

There are many variations of Figure 9. The point about Figure 9 is the inclusion of the condenser, which means that Figure 9 will act differently on different frequencies. It is, therefore, a tone control, not a volume control. Variations of Figure 9 may include a choke coil instead of the condenser, or a choke coil in addition to the condenser. Some variations may omit the resistor entirely in favor of a tap switch that permits choice between a number of condensers of different ratings.

The distinguishing points about the diagram of a tone control are, generally: (1) either a variable resistor or a tap switch providing choice of settings, and (2) a condenser or inductance, or both, associated with the combination. Where such a combination is found it usually is safe to diagnose "tone control" without further investigation. If, however, both condenser and inductance are omitted from the combination, the answer is "volume control" as in Figure 8.

Voltage Divider Circuits

The voltage divider is among the most difficult combinations to recognize, although practically all amplifiers have one. The arrangement is very often drawn in such a way that its nature is not obvious; the fact that there actually is a definite combination of parts and connections often is concealed by the way the parts are scattered through the drawing. Hence two different voltage divider circuits are shown here: Figures 10 and 11.

In Figure 10, assume a source of d.c. to be connected across the two wires leading to the right, and say the potential is 400 volts. That voltage causes current to flow downward through the resistor, creating a voltage drop. If the top is positive, then there will be a 400 volt difference between the top and bottom wires. But between the bottom wire and the uppermost of the three wires running off to the left there may be a potential difference of only 300 volts. Between the bottom wire and the middle one of the wires that run off to the left the potential difference may be 200 volts —and so on.

Most amplifiers have several tubes requiring different plate voltages, all of them being supplied from the same source. A voltage divider circuit (Figure 10) is the commonest way of obtaining the various voltages needed. A voltage divider will be found in the majority of multi-tube amplifiers, and if the projectionist can recognize the diagram of one when he sees it, he will be saved the trouble of tracing a lot of parts and connections in detail.

Figure 11 is a voltage divider, and the reader will observe that it is absolutely identical, electrically with Figure 10.

Now, assume the upper line of Figure 11 to be stretched lengthwise, with considerable prolongation of the length of the wires between the separate resistor segments. That is the way the voltage divider looks in many amplifier drawings. It is still a voltage divider; it is still electrically identical with Figure 10, but because the resistors are scattered and connected by comparatively long lengths of wire, it may not be easily recognizable. The reader may feel some interest in taking up a number of amplifier diagrams, such as have appeared many times in the pages of I.P., and looking through for the voltage dividers, try to identify them with as little delay as possible.

Tube Coupling

Figure 12 is a coupling circuit. If the amplifier has more than one stage there must be coupling between the stages to pass the speech current along. Therefore every amplifier of more than one stage has coupling circuits.

The combination of Figure 12 can be eliminated completely by means of transformer coupling, in which case the transformer constitutes the coupling circuit. But amplifiers that use transformer coupling throughout are almost nonexistent in theatre practice. Figure 12 is represented in practically every projection room in the United States, and should not be hard to identify in the amplifier circuit drawings. It may, of course, be represented in a slightly different way, but the combination of two resistors and a condenser, joining the plate of one tube to the grid of another, is or ought to be unmistakable.

In Figure 12 plate d.c. is supplied to the left-hand tube through the left-hand resistor. Obviously that positive voltage must not be allowed to reach the grid of the right-hand tube. The right-hand resistor supplies the grid with negative bias, obtained from some such arrangement as that of Figure 3. The condenser keeps the direct positive and negative voltages apart, and at the same time pro-

(*Continued on page 24*)

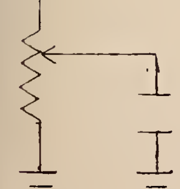


FIGURE 9

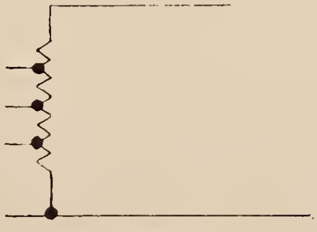


FIGURE 10

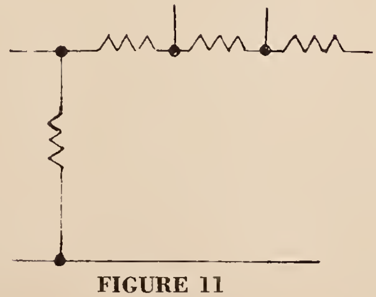


FIGURE 11

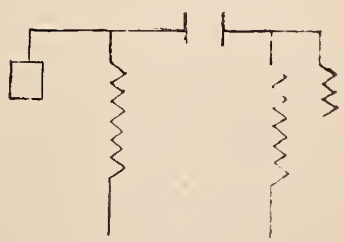


FIGURE 12

Presenting: Leo F. Barber

Leo Barber being congratulated by Mayor Frawley, of Lynn, Mass., as he assumed his duties as president and business agent of L. 245 for the 31st consecutive year

LEO F. BARBER, president and business agent of Local No. 245, Lynn, Mass., was born in Lewis, N. Y., on February 12, 1890. When he was four years old his family moved to Lynn, where he has remained ever since, attaining a foremost position as a labor and civic leader.

As was the case with many other oldtimers, he learned the business the hard way. While attending Classical High School he got a job as usher at the Auditorium Theatre, where vaudeville was booked by William Morris and later by the Keith office. It was the standard policy to run seven acts and close the show with a Vitagraph reel. Barber became friendly with Harry Bailey, of the Vitagraph Company, and helped him transport the movie equipment each Sunday from Lynn to Boston, for the latter city permitted Sunday shows, while the blue laws still held in Lynn.

It was some job to tear down the machine, but Barber and Bailey would take it and the other equipment on the train each week, set it up and run a show in Boston on Sunday, reversing the proccss to re-open on Monday in Lynn. Those were the happy and good old days!

At the time the film operator and machine (Vitagraph) both were hired from the Vitagraph Company. After an apprenticeship at the Auditorium, including the weekly Boston interlude, Barber moved across the street to operate a Powers' No. 5 machine, with film running into a tank. It was while working at this job that he joined the Stage Employees Local, No. 73, and when a few years later President Shay chartered the Moving Picture Machine Operators Local No. 245, he became affiliated with it. He is president of both locals—Local 73 for twenty years, and Local 245 for over thirty years.

Barber has held the office of either president or secretary of the Lynn Central Labor Union for more than twenty years. He is responsible in a large measure for the organization of a new labor group in Lynn, now about one year old—the Lynn Council of Labor. It is a delegate body of all organized labor, C. I. O., A. F. of L., and the independent unions. His first I. A. convention appearance was in Ottawa, Canada, where he served on the Laws, Ways and Means Committee. He has served on Grievance Committees at many I. A. conventions since then.

This is another in our series of who's who in the projection world. From time to time I. P. will present to its readers brief word portraits of leading figures in the craft.—Ed.)

EASTMAN KODAK DONATES EDUCATIONAL FILMS

Eastman Kodak Company has donated its 16-mm library of approximately 300 silent classroom films to the University of Chicago for distribution through that institution's affiliate, Encyclopaedia Britannica Films, Inc., according to an announcement by the board of directors of the affiliate. This action brought to completion an educational project undertaken more than 15 years ago by Kodak for the purpose of establishing classroom motion pictures on a practical basis. Encyclopaedia Britannica Films also distributes the sound motion pictures of the recently acquired Erpi Classroom Films.

In making known his company's decision, Adolph Stuber, Eastman vice-president, said that "the company is gratified that its pioneering efforts in the field of classroom motion pictures are culminating in the present development. As early as 1923 George Eastman envisioned the use of motion pictures produced specifically for classroom instruction, but found little prospect at that time that any organization with sufficient resources would enter upon a program to produce films of this type.

"It can now quite safely be said that the place of motion pictures in the field of visual education is firmly established, and the Eastman company can bow out."

CLARIFIES AVAILABILITY UNDER WPB ORDER L-325

Homer B. Snook, manager of theatre equipment sales of the Radio Corporation of America, points out that eligibility for motion picture sound and projection equipment under the War Production Board Limitation Order L-325 is not in itself a guarantee of availability of such equipment. Mr. Snook states that it appears many exhibitors may have the impression that they have only to meet the conditions of eligibility set forth in the order to be assured of delivery. The availability of equipment, on the contrary, he explained, is restricted also by WPB limitations on the number of equipments which manufacturers may produce and deliver for civilian use.

"RCA thus far has been able to meet the replacement needs of quite a number of theatres under terms of the WPB order," he said, but the number of eligible purchasers greatly exceeds the quota of equipment which we are permitted to supply." Mr. Snook explained procedure under the order calls for submission to WPB of pertinent information concerning each order or application placed with the company or its dealers. The order may be entered and delivery made only after approval is received from Washington, and then only if equipment covered falls within the company's civilian quota.

CONSERVATION TRENDS REFLECTED IN SERVICE RENEWALS

Recent sound service contract renewals reflects recognition of the need for conservation of motion picture theatre equipment, now irreplaceable because of the war, according to W. L. Jones, vice-president of the RCA Service Company, Inc. "We have recently negotiated a substantial number of service contract renewals with both theatre chains and independents," Mr. Jones declared. "The steady flow of such agreements indicates a general recognition among exhibitors of the essential need for regular inspections and service, even more imperative now than in normal times."

Among circuit groups signing are: Paramount Richards, Dixie Theatres, and United Theatres, all with New Orleans headquarters, with Edward Auger, national office representative, handling negotiations. Others signed are: Notopoulos Theatres, Altoona, Pa.; A. M. Ellis, Philadelphia; Bijou Amusement Co., Nashville, Tenn., and Eskin Theatres, Milwaukee.

W. E. DIRECTORS RE-ELECTED

All members of the board of directors of the Western Electric Company were reelected at the annual meeting of stockholders, and at the ensuing meeting of directors all officers were re-elected.

TELEVISION TODAY

VIII. — Radio Relays

By *JAMES FRANK, JR.*

SINCE such a wide band of frequencies is required for television transmission, the number of television programs that can be simultaneously transmitted is somewhat limited due to the size of the ultra-short wave spectrum. It is, therefore, undesirable to use up any more channels than necessary for one program. Since these signals cannot be received for more than about fifty miles, however, transmitting stations far enough apart can operate on the same wave length without interference. Radio relay links must be economic in equipment and operation expense.

Several years ago, the Radio Corporation of America set up an ultra high frequency relay station at Arney's Mount, near Mount Holly, N. J.[1] At Arney's Mount, 41 megacycle television signals from the Empire State Building, 63 miles away, were picked up and retransmitted to the RCA Victor plant at Camden, N. J., a distance of 23 miles on a frequency of 79 megacycles. Directive antennas were used at Arney's Mount for reception as well as for transmission. The 120-line television picture, used at that time, was clearly and reliably received at Camden during test schedules over a period of several months.

The one-way television relay demonstrated the practicability of automatically relaying wide band transmissions. RCA Communications undertook to develop a two-way wide band relay system to determine its possibilities for handling traffic between New York and Philadelphia, particularly for facsimile methods. This relay system was put into operation. Its success indicated its usefulness for television networks as well as facsimile. Thus the obstable of distance limitation is no longer an important factor. The perfection of automatic, unattended relay stations that do not interfere in their reception and transmission has been accomplished.

The two-way radio relay link from New York to Philadelphia operated on approximately 3 meters, or 100,000 kilocycles per second. Since these high frequencies attenuate, or diminish, very rapidly beyond the horizon, a survey indicated the necessity for adding a second relay point at New Brunswick, N. J., in addition to a relay at Arney's Mount. A relay near the New York end was also required in order to lay down a strong enough signal in New York City to ride well above the high noise level experienced in urban areas. Figure 40 shows the general arrangement of the relay stations.

It will be noted that at each relay point there were two receivers and two transmitters, one for the northbound

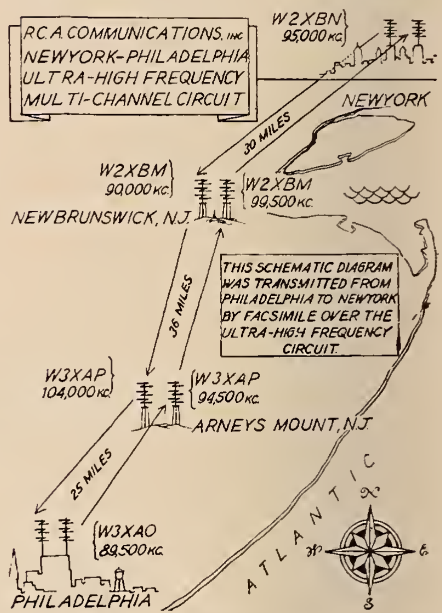


FIGURE 40. *Diagram of New York-Philadelphia ultra-high frequency relay system*

In previous installments of this series of articles it was explained that the requirement for a very wide frequency band for television transmission is a band of 6 megacycles width in the ultra-high frequency spectrum. Furthermore, the characteristic of these ultra-short waves limits the practical transmission distance to the distance from the antenna to the horizon, or approximately 50 miles. It is interesting to note that for the past several years, however, satisfactory reception of television signals from New York City have been received and rebroadcast at Schenectady, N. Y., a distance of 129 miles, even though the relay station site is well over a mile below a clear line of sight from the top of the antenna in New York City.

From a purely practical and economic point of view, everyone seems to agree that the future of television in this country will largely depend upon the ability to broadcast programs over networks similar to the present practice of sound broadcasting. For a nationwide coverage it is not practical to originate television programs at each station, nor can the industry afford the high cost of several studio facilities at each station.

In view of the facts outlined above, broadcasting television signals over networks is not comparatively easy as is sound broadcasting. There are two methods of connecting television transmitting stations into television networks. The one involves the use of a special and very expensive telephone line known as the coaxial cable. The other involves a radio relay link.

Recently there has been much newspaper and tradepaper publicity about plans for establishing these facilities for television networks. At this time it seems that both methods of connecting television stations will be employed.

The General Electric Co., appears to be preparing to employ radio relay links to create television networks through the use of a new electronic disc-seal type out of which there has been developed a large new family of ultra-high frequency tubes, and which now operate (in war applications) in parts of the frequency spectrum impractical of use before the war.

A short time ago the National Broadcasting Co. issued a statement to its affiliated stations on television. Included in this was a copy of a letter to them from the American Telephone and Telegraph Co. Its present plans for providing television network facilities in the near future are stated as follows:

"As a part of its program to meet expected increasing demands for long distance telephone service, the Bell System is planning to construct within the next few years a large amount of coaxial cable. The extent of this construction, when and where it will be undertaken, will depend upon the requirements of the armed forces, general business conditions, the volume and distribution of long distance telephone messages, the availability of the necessary manufactured cable and equipment, and other factors. Tentatively, however, our plans call for between six and seven thousand route miles of coaxial cable in the next five or six years."

They further stated that such cables would be first installed "where the need for additional telephone channels in substantial quantity is expected to be the most urgent and the provision of coaxial cable appears to be the most desirable method of meeting this need. When coaxial facilities are being constructed for telephone purposes the Bell System Companies would be glad to provide additional conductors for television if then it appears likely that there will be a demand for such facilities sufficient to justify the large additional investment."

From this statement, it might be assumed that radio relay links might best be used in those areas where demands for telephone circuits do not justify the installation of coaxial cables in the near future.

Let us now investigate how each of these methods of connecting television transmitters operates.

relay and the other for the southbound relay. For economy, it was desirable to locate the north and southbound equipment. both transmitters and receivers, in the same building. It was also desirable to be able to locate the receiving and transmitting antennas in close proximity. This requirement introduced some special problems to avoid cross-talk between the transmitters and to keep either transmitter from interfering with either receiver.

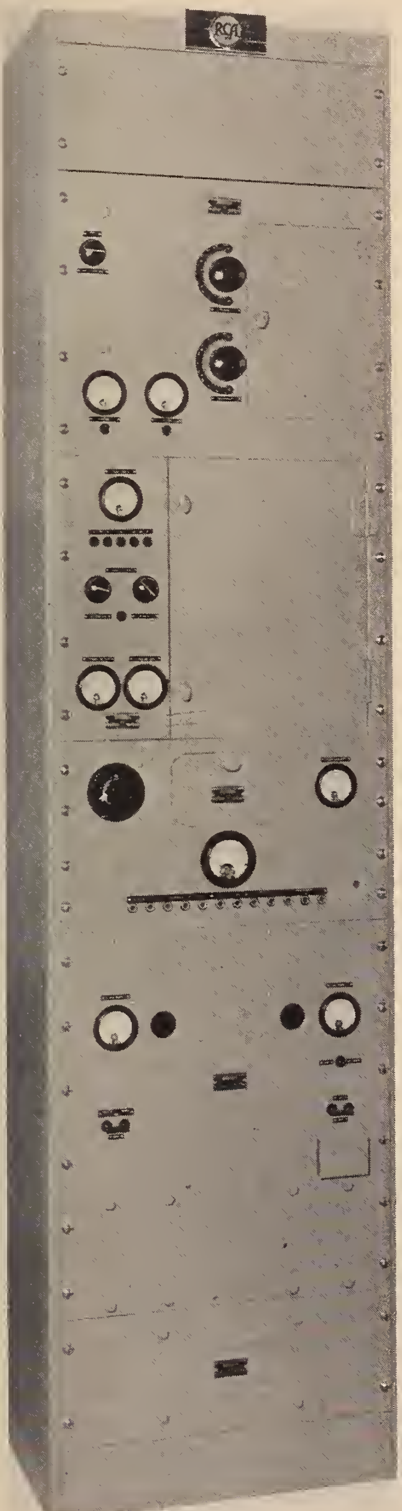


FIGURE 41
Ultra-short wave receiver

To avoid any possibility of cross-talk between the transmitters, without excessive precautions, frequency differences on the order of 10% were considered necessary. To avoid interference in the receivers. it was desirable that the receiver frequencies be about 5% from either transmitter frequency. It was also desirable to lay out the frequency allocation plan in such a way as to provide for future extension of the relaying system in several directions from a given city. Duplication of frequencies is practical for transmitting stations not closer than about 120 miles.

Figure 41 shows one of the receivers and in Figure 42 can be seen a close-up of two sections of this receiver with the doors open. The receiver shown in the latter figure uses, as will be seen, an "Acorn" triode which is contained in the casing of the resonator. Specially designed power tubes are also used. These all make for low cost of equipment and operation.

The frequency of the transmitters was held to close limits. The maximum carrier power was approximately 100 watts, but ordinarily the transmitters were operated at about half power to increase the reliability of the transmitters at unattended stations.

Figure 43 shows one of the relay transmitters. The resonant line control, master oscillator and power amplifier are located in the circular tank-like structure at the right. The panels at the left contain power supply, controls, and modulator.

Directive transmitting and receiving antennas were used. The transmitting antennas utilized a vertical array of horizontal dipoles with a similar array a quarter-wave behind for a reflector. The transmitting antennas at New York were located on the roof of the Continental Bank Building at 30 Broad Street. The horizontal dipoles were approximately half a wavelength long and were spaced vertically half a wavelength. No insulators were used to support the dipoles.

The receiving antenna for picking up the north bound signals from New Brunswick was located on the roof of the City Bank-Farmers Trust Building. This antenna was a duplicate of one of the transmitting antennas.

The control equipment at the repeater station is illustrated in Figure 44. The receivers at all points operated continuously. Let us assume that New York wished to start up the south bound relay. The New York transmitter was started by d.c. control, and as soon as it was on the air, the fact was indicated to the control point by an indicator. The remote start-stop switch was then closed, putting a 595-cycle tone on the line to

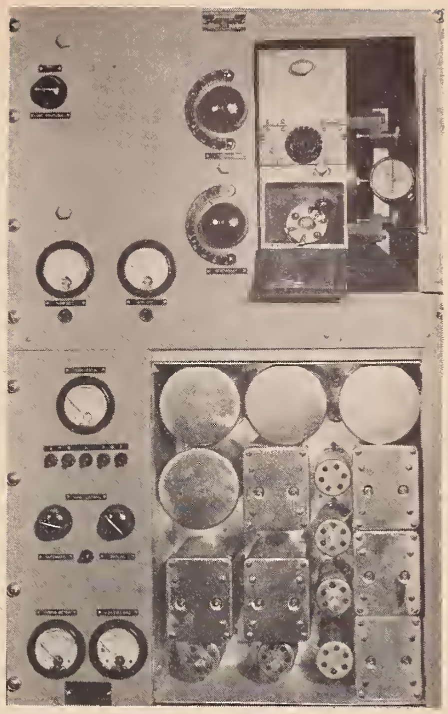


FIGURE 42
Section of RCA ultra-short wave receiver showing use of "Acorn" tube

the transmitter. This tone was picked up on the receiver at New Brunswick, and passed through the 595-cycle filter shown in Figure 44.

The tone was amplified and rectified. The rectified current operated a small relay, which, in turn, operated a large a.c. relay that applied 60-cycle power to the transmitter and its modulator. Automatic time delay relays turned on the plate power after the filaments warmed up sufficiently. As soon as the New Brunswick transmitter was on the air, it, in turn, transmitted the 595-cycle tone on to

FIGURE 43
Front view of a relay transmitter

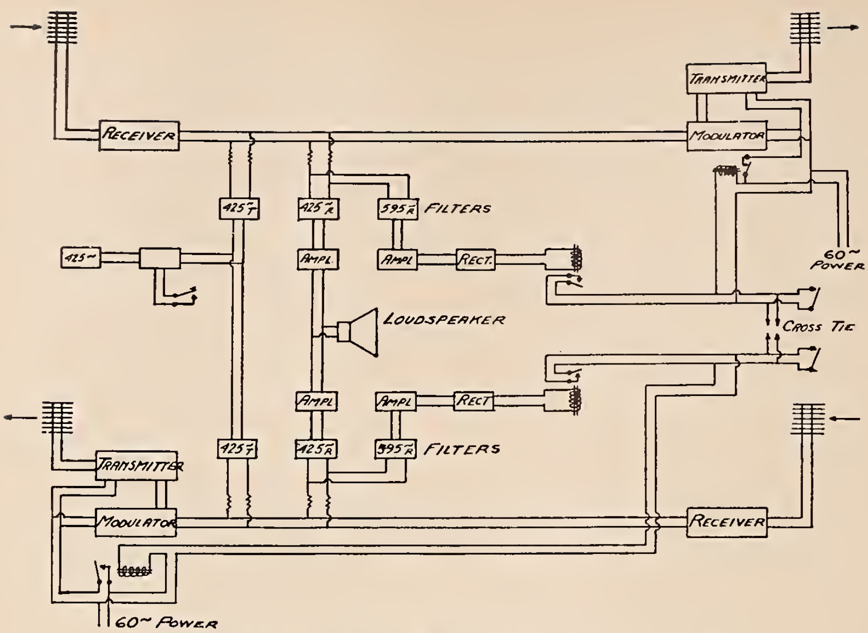


FIGURE 44. *Schematic diagram of a relay station*

Arney's Mount. As soon as the Arney's Mount transmitter was on the air, the tone was heard at Philadelphia. If desired, the one could be tied back over the circuit at Philadelphia so that the north bound circuit could automatically be started in the same way. However, to save time, it was preferable to close the contacts marked "cross tie" in Figure 44 which caused the north and south bound transmitters at a given point to start up together. With this arrangement, either New York or Philadelphia could start the entire circuit with a minimum of delay. The circuit was shut down by removing the 595-cycle tone.

Although the circuit was unattended, it was desirable to provide communication at the relay points in order to assist the service man in checking up the circuit when he inspected the relay stations or was called out to correct some difficulty. The communication arrangements are shown in Figure 44.

If any other point on the circuit wished to communicate with the service man, they could key their local 425-cycle source, which passed over the circuit, was amplified at the relay station, and heard on the loudspeaker. Any communication in either direction was heard on the loud speaker since it was associated with amplifiers on both sides of the circuit. Telegraph sounders were used at the terminal offices rather than loudspeakers.

There is no doubt that radio relay links of this type will be used to create television networks for suitable coverage of large areas of the country. With a satisfactory range of only about 50-100 miles, it can be seen that many more television transmitting stations will be required for good coverage than existing sound broadcasting stations so that much larger networks will be necessary.

A new type of intercity communications by radio relays which will provide, among other things, a network for transmission of television programs was announced in March 1944 by the American Telephone and Telegraph Co. The work will take two years to complete at an estimated cost of more than $2,000,000 and will be located between New York and Boston. Stations will be spaced about 30 miles apart throughout the route.

Coaxial Cable

The Bell System has been working for several years to develop satisfactory means of transmitting television signals over wires. The biggest obstacle involved was to provide a circuit that would (1) efficiently transmit a wide band of frequencies without discrimination between frequencies, (2) would be to a high degree immune to interference from extraneous sources of electrical energy, and (3) could transmit all frequencies at the same speed.

The result of this costly development at this time is the coaxial cable. This cable was originally designed for material economies in the provision of large groups of long distance telephone facilities. The coaxial cable consists essentially of a conductor of 13-gauge copper on which hard rubber disks have been placed at intervals of about ¾ inch to keep the conductor at a uniform distance from the sheath.

Figure 45 shows a modern coaxial cable. The main conductor may be seen at the left with the copper tapes unwound. The metallic tube consists of nine overlapping copper tapes made to form a solid copper tube 20 mils thick. The outer lead sheath is about ⅞ inch in diameter.

Due to the "skin-effect" high-frequency signals are carried largely in the outer skin of the central conductor and along the inner surface of the outer conductor. Currents that are caused by the high-frequency external interference flow substantially on the outer surface of the outer conductor, and are, therefore, separated electrically from the signal currents by the intermediate metal of the outer conductor. Thus it is possible to subject the signals to enormous amplification to offset the considerable attenuation or loss of signal strength due to transmission losses, as a result of this protection from outside interference.

The first coaxial cable was installed for experimental purposes from New York to Philadelphia at a cost of about $540,000. This cable is about 95 miles long and is designed to transmit television signals with a frequency band of about 1,000,000 cycles per second width. The overall loss of this transmission line is about 600 decibels. To overcome this problem, ten repeaters are installed at intervals of ten miles. Each repeater, Figure 46, has an amplification of about 60 decibels and is equalized so that the final result is a zero loss over the entire frequency range. This requires amplifying the high frequencies to a greater extent than the low frequencies since the loss is greater in the high frequencies.

A characteristic of wire transmission

(Continued on page 25)

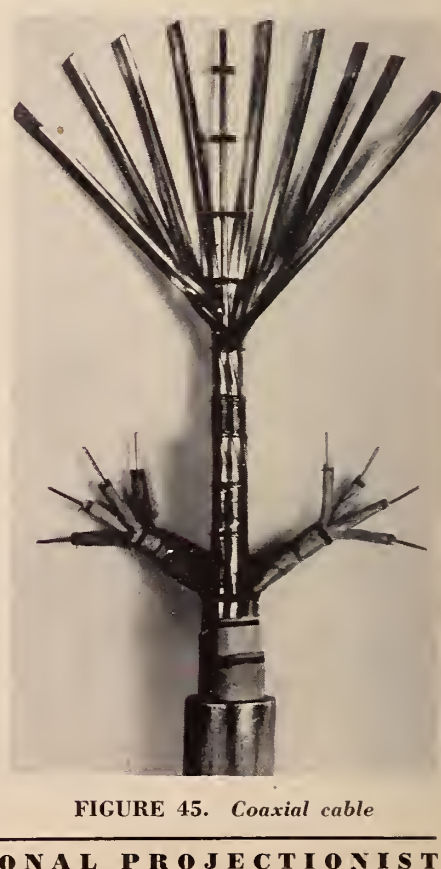


FIGURE 45. *Coaxial cable*

IN THE SPOTLIGHT

By HARRY SHERMAN

WATCH for the beginning of a new series of articles in a forthcoming issue of INTERNATIONAL PROJECTIONIST in which our readers will be instructed in those phases of the electronic arts affecting the craft. This series has been prepared especially for the readers of this publication by a well-known instructor of radio and television. The articles will be profusely illustrated with photographs, diagrams, etc., and each installment will have a question and answer department. Take a tip and make sure that you get your copy of I.P. each month so that you may have the complete series. Due to the paper shortage, only a limited number of extra copies are printed each month and these usually are disposed of very quickly.

● We received a very nice letter from Frank E. Morrison, president of Local No. 225, Atlanta, Ga., inviting us (as a Past Master) to attend a meeting of his Masonic Lodge if we should happen to wander down his way. Thanks, will take you up on that on our next visit to Atlanta.

Morrison, by the way, is the Worthy Grand Patron of the Eastern Star for the State of Georgia. In addition, he is the second vice-president of the Atlanta Masonic Club, a civic organization with Masonic membership as its basis. In 1941 he also was Master of the E. A. Minor Lodge No. 603, F. & A. M., of Atlanta. Incidentally, many years ago Fred Raoul, the assistant president of the I. A., and also a member of Local 225, was a member of Lodge No. 603.

● The founding of the Nightingale Club, a fraternal organization formed by members of Local No. 199, Detroit, Mich., many years ago makes a very interesting story. It seems that about nineteen years ago a group of men (sixteen to be exact) met one midnight after theatre closing and wondered what to do for a little fun and relaxation. Someone in the party suggested bowling and the others agreed. The bowling party was a success and the men decided to get together more often and repeat the fun.

Eventually they organized the Nightingdale Club, the purpose of which was to promote good fellowship, athletic and social activities for the members. The Club, a non-profit organization, has a membership of 75 and meets once a month at 1 A.M. To this day it has remained essentially a bowling club, with eight teams in the bowling league. Each year the league participates in both the A. F. L. and City tournaments. At the end of the bowling season a dinner-dance is held for members and their families and friends, with all expenses for food, music, beer and other incidentals being paid for by the Club.

Present officers of the Club are H. S. Morton, *president;* Edgar Douville, *vice-president;* Michael Badarak, *treasurer;* Harry Mason, *financial secretary;* J. R. Davison, *recording secretary;* Jack Lindenthal, *chairman,* and Edward Waddell and Romulus Albu *members of the bowling committee.*

● Another member of the I. A. has been elected head of a state labor organization. Frank A. Walsh, president of Local No. 414, Wichita, Kans., was elected president of the Kansas State Federation of Labor.

● The oldest local in the Alliance, New York Stage Hands Local No. 1, recently nominated *without opposition* business agents Vincent Jacobi and Solly Pernick. Local No. 1 had, in the past carried on strong political campaigns for this office, and it speaks well for the ability of both Jacobi and Pernick that they have reached the point where they encounter no opposition to their continuation in office.

● Ludwig Zwilgmeyer, charter member of Hollywood Local No. 165 and former assistant chief of projection at Columbia Studios, is now attached to the cutting and editorial department of the Signal Corps Photographic Center located in Astoria, L. I.

● The National War Labor Board, in Washington, D. C., has just directed the Allied Amusements, Inc. (E. M. Loew), of Boston, Mass., to restore the $83 weekly salary to the projectionists at the Majestic Theatre. This confirms the decision of the regional board that the company cut the salaries of these projectionists to $55 a week "in contravention of the economic stabilization act." The fight put up by Thad Barrows and Jimmy Burke, of Local No. 182, to protect the rights of their members should be inspiring to every labor leader in the Alliance. Hats off to Messrs. Barrows and Burke!

● On a recent visit to the offices of Walter Green, president of National-Simplex-Bludworth, Inc., we noticed a white china pot prominently displayed on his desk. The explanation for its presence there is a hilarious one.

● More anent the new I. A. organization, Associated Electronic Engineers: We have been reliably informed that a 10% increase, seniority rights and adjustments, and overtime pay, are among the important features of a two-year contract recently signed by the two major sound service companies, RCA Service Company and Altec Corporation. This contract is subject, of course, to the approval of the War Labor Board.

Present at the negotiations were Louis Krouse representing the I. A., with W. L. Jones negotiating for RCA and Bert Sanford representing Altec.

● In order to handle the ever increasing amount of portable and 16-mm shows within the jurisdiction of Local No. 171, Pittsburgh, Penna., this progressive local has not only succeeded in obtaining a goodly amount of the work through the efforts of its officers, but is also conducting a course of study and training in this particular phase of the projectionist's work.

Realizing that the 16-mm situation was somewhat out of control and also aware of the constant expanding of the 16-mm field in industry, education, commerce and sales promotion, a committee was appointed to handle the matter. Committee chairman David Thomas, along

with Thomas Hughes and Ernest Jones, committee members, have set up a program that befits a college course.

Well attended meetings have been and are being held weekly. The fact that there has been much interest and response at such an early hour as 9 A. M. speaks for the enthusiasm the members have shown. At these sessions various models of portable projectors are displayed and demonstrated. The committee has obtained the services of member Charles Appel, who is considered a specialist in the field of portable projection. Member Joseph DeMann, in charge of the screen rooms, also lent his able assistance.

It is hoped and expected that Local 171 through the proper training of its members will keep control of all portable and 16-mm work.

● We recently learned that about 40% of the membership of Local No. 310, Atlantic City, N. J., is now serving with the armed forces and that the figure will soon rise to 50%. However, due to the aggressiveness of business agent Gus Hilton every projection room in the jurisdiction of Local 310 is properly manned, and he is determined that under no circumstances will the local permit female projectionists to enter its territory. With men like Hilton and Lou Clendening guiding them the members of Local 310 do not have to worry about competition of any sort.

● Earl Morin, the popular chief inspector of Connecticut State Police, and holder of an I. A. withdrawal card, recently became a benedict. He married the lovely (his description) Mrs. Harriet Foster, mother of a nine-year-old daughter.

● Not all labor boards are heartless. For instance, take the one operating in the vicinity of Milwaukee, Wis. This board generously (?) approved a three per cent increase. Is that a razzberry we just heard?

● We were very much surprised at the lack of projectionist attendance at the recent SMPE convention held in New York. We do not know the reason for the poor showing by our craft and we wonder if the trouble may not lie in the fact that apparently very little effort is made to work out a closer relationship between the Society and the unions. Local 306 has a membership of over 2,300, and in our humble opinion at least several hundred members would have attended the sessions if the officials of the local had been advised in advance of the event and an open invitation were extended to the members.

Among the out-of-town projectionists attending the sessions we noted Andrew J. Seeley (Syracuse), Jack Sawyer (Buffalo) Joe Engle (Nassau County), and George H. Walter (Panama Canal). John Krulish, Harry Rubin, John Harding, Jess Hopkins, Harry Hollander, Ben J. Stern, Morris Katz, and Joe Basson were the only local projectionists we can recall seeing at any of the meetings.

● We hope George Thomas, business agent of Denver, Colo., Local No. 230, is sufficiently recovered from his recent illness to attend the forthcoming St. Louis convention.

● The Red Cross fund has been swelled by a $1,000 donation—gift of Local No. 143, St. Louis, Mo.

● "Pat" Offer, the genial business agent of Hollywood Local No. 165, returned to Hollywood several weeks ago after a six-weeks' stay in New York where he took part in the negotiations between the eleven I. A. studio unions and the film companies. Under the able direction of International President Dick Walsh and Secretary-Treasurer Louis Krouse, Offer successfully concluded negotiations for his local and here are a few highlights of the new contract which replaces the one that expired January first:

1. Two weeks' vacation with pay, each year.

2. 5% overall increase, plus adjustments of inequalities in the Process Classification where an additional 10c per hour was given.

3. A seniority clause was granted which, for the first time, guarantees job security to the membership.

4. All members working on a 7-day week are now to work 6 days a week at the same salary.

5. All work performed between 10 P. M. and 6 A. M. shall be paid for at 110% of the prevailing rate. (As this time is normally paid at time and one-half, an additional 10% will be paid.)

6. All time worked in excess of 14 hours shall be paid for at two and one-half times the hourly rate.

7. Calls may not be changed or cancelled after 8:30 P. M. of the day preceding the call.

8. When a meal period is not given within 6 hours such delayed meal shall be paid for at two and one-half times the hourly rate.

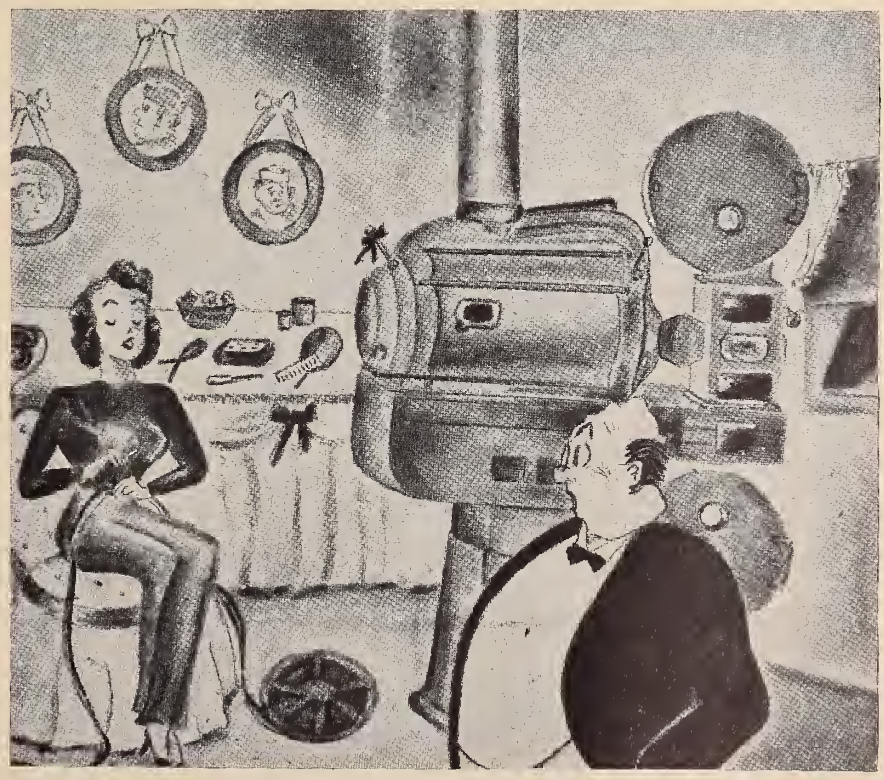
9. It is written in the contract that all returning members now in service shall be returned to the positions they held prior to their induction in the armed forces.

10. A procedure of settling disputes within time limits has been set up.

Further comment would be superfluous —the aforementioned items speak for themselves. Swell going, Pat, and congratulations.

● Morris Kravitz, New York business agent of Local No. 306, was recently tendered a testimonial dinner by his brother

(*Continued on page* 23)



(Reproduced through courtesy of Motiograph)

"If you'll just be patient, Mr. Heft, I'll have this film sewed together in no time."

IP AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

W. E. 753 Changeover Switch Hint

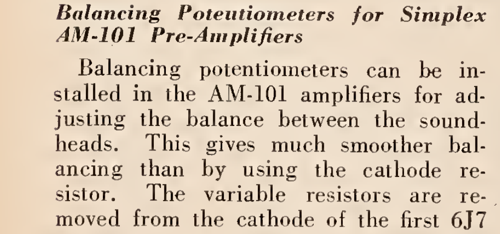
The exciting lamp changeover section of the W. E. 753 type fader cabinet may be disconnected since both exciting lamps are in series. Two small single-pole double-throw switches installed on front of the cabinet permit change of exciting lamps during their operation by switching from lamp to a resistance of 4 ohms, thus maintaining the same current throughout the series circuit. This change permits complete inspection of optical system and prism assembly during period of operation of equipment. Since this type of fader usually is associated with the W. E. 211 type soundhead, whose maintenance requirements are rather critical, this improvement is worthwhile.—D. W. McMillin, *RCA.*

Meter Readings on PG-32 and 92 Equipments

Readings of the RCA-845 Radiotrons can be made with the Weston 772 meter by using one test lead in pin jack and the other in the one milliampere X pin jack and dividing the readings by two. The selector switch should be on the 250-milliampere position. This arrangement is for the PG-32 and PG-92 equipments where jacks are provided for emission readings.—M. T. Deming, *RCA.*

Balancing Potentiometers for Simplex AM-101 Pre-Amplifiers

Balancing potentiometers can be installed in the AM-101 amplifiers for adjusting the balance between the soundheads. This gives much smoother balancing than by using the cathode resistor. The variable resistors are removed from the cathode of the first 6J7 so that there is only a 5,000 ohm cathode to ground resistor in the circuit. A change of about 4 DB can be obtained by using the values recommended in the accompanying diagram.—C. D. Welch, *RCA.*



Rectifier Substitution

When a 5Z3 tube is not available for use in the modified 42-type amplifier, I suggest that an octal socket be installed in place of the present unused socket, the octal to be wired in parallel with the present 5Z3 socket. Thus either a 5Z3, a 5T4, or a 5Y4G may be used.—A. C. Schroeder, *RCA.*

Soldering Tip

When a soldering job calls for extra good mechanical strength, I solder with Babbit's metal using rosin flux.—R. H. Bisbee, *RCA.*

Conservation of Frequency Test Reel

For saving wear and tear on the frequency reel, I do not thread the film through the gate and on the intermittent sprocket. I put the film from the top sprocket right through the space between the closed gate and the opened lens slide and direct to the lower sprocket. The lens slide has to be held back with a bit of wood or some other object about 1¼" wide. The film must not be too loose or it will foul the metal on the gate and the lens slide.—Maurice Rushworth, *RCA.*

Adjusting Cap On Oil Cup SN-190 for Proper Operation

When the cap on the oil cup SN-190 of the SH-2008 stud in the Simplex soundhead (or for any other piece of equipment for that matter) is so closely fitted that unless it is sprung slightly to permit a little air, the oil will not flow and, as a consequence, the drive gear will run hot.

Since many of the same type oil cups are used on various projectors, especially shutter shaft assemblies—which is the highest speed shaft in a mechanism—similar trouble will be prevented if the procedure outlined is used.—W. W. Wehr, *ALTEC.*

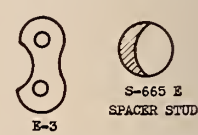
Emergency Sprocket Operation

Recently I cleared an emergency on a Universal base by having the projectionist remove the key from the movietone sprocket and loosening the lock-nut so that the sprocket could spin freely on its shaft. The film was then threaded in the usual manner and was pulled down by the holdback sprocket; the movietone sprocket merely held the film in place for proper scanning.

The above procedure was followed on the built-up type sprocket. However, for the solid type sprocket, it is suggested that after removing the pin from a worn sprocket (usually found lying around the projection room) dress it out so that it will spin freely on either shaft. In an emergency of this nature, the projectionist could operate with this sprocket until the engineer arrives with a fibre gear.—A. D. Brooks, *ALTEC.*

Modification of Film Guide Assembly

The modification of part E-3 film guide assembly used on W. E. TA-7260-B aperture to eliminate film scratch was accomplished in the following manner: It was found that the back side of the film had worn that portion of the carrier between the upper film guides. A small



hand grinder high speed rotary electric tool was used to cut away a portion of both spacer studs, as indicated in the shaded portion of the diagram above. This permitted the film guide assembly to seat deeper on the carriage, thereby making it possible to adjust the carrier stop screw so that there was greater clearance for the film. The usefulness of film guides may be greatly prolonged by following this procedure.—C. D. Welch, *RCA.*

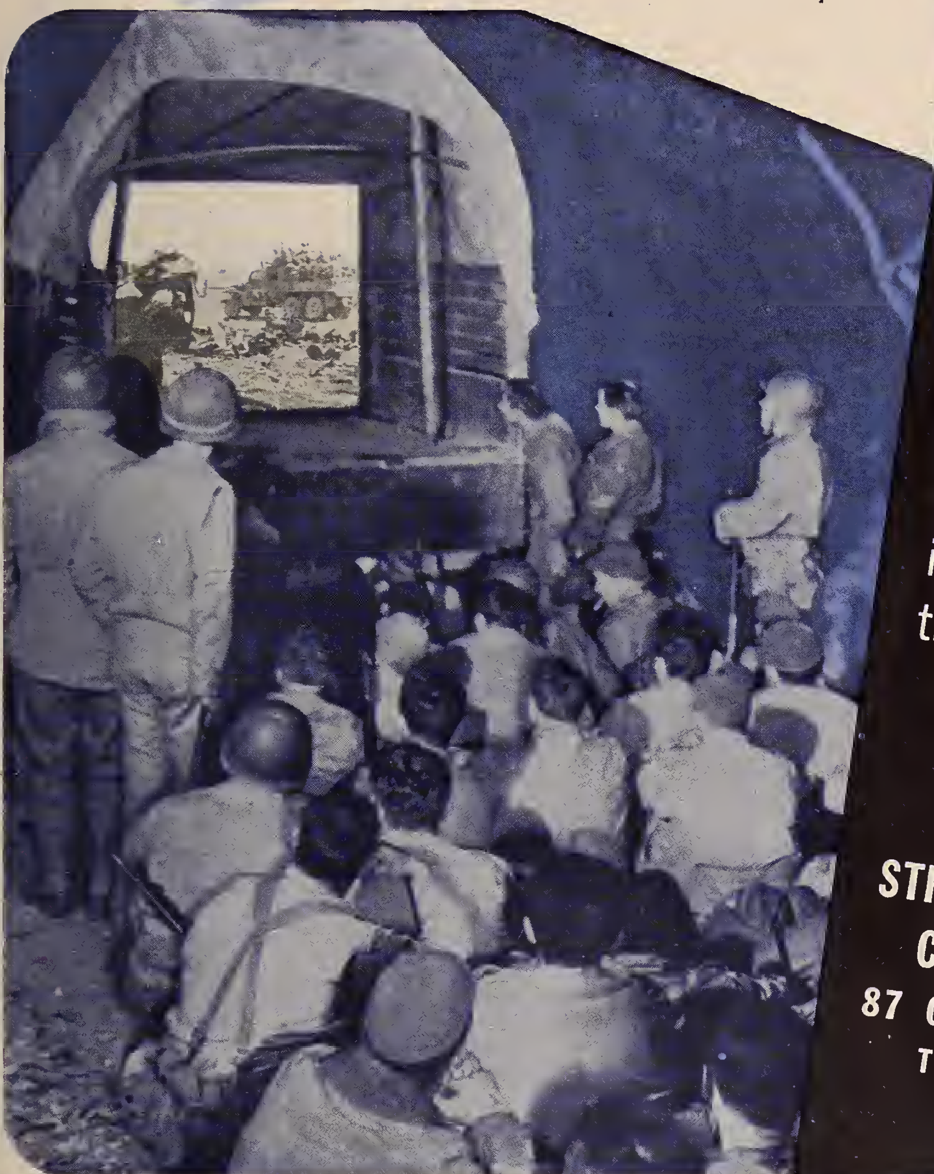
Preventing Studs from Working Loose

It has been suggested that some means be found to prevent the ASP-847 stud from working loose in 206 reproducer sets used in "grind houses." Ordinarily, the use of a lock washer such as is now supplied would be sufficient for this purpose, but due to the possibility of some screws fitting somewhat loosely in the tapped hole, it seems that for extreme cases additional treatment is required.

To do this, clean the threads of the

(*Continued on page* 26)

There are Theatres 'Round the World Today



Allied troops enjoying a motion picture during the lull of battle in the Tunisian area.
A Signal Corps Photo

...because you shared your projection equipment with our boys on the fighting fronts.

BUY MORE BONDS TODAY. It means the saving of lives and the earlier return of our boys.

★

THE STRONG ELECTRIC CORPORATION
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★

THE WORLD'S LARGEST MANUFACTURERS OF PROJECTION ARC LAMPS

Coated Lenses and Their Efficiency†

By *K. M. GREENLAND, PH. D., A. INST. P.**

IN STRIVING for a perfect optical system, the lens computer makes the most of the optical glasses available, and the glass-maker and the lens polisher do their best to meet the specifications of the computer. But there is one opposing factor over which they have very little control: that is the loss of light due to reflection at the surfaces of each lens. The number of reflecting surfaces in a system of lenses can be reduced by cementing together some of the surfaces, and this is done wherever possible, but there is an obvious limit to the application of that remedy.

The reflectivity of a glass-air surface usually is between 4% and 7½%, according to the type of glass, so that the loss of light by reflection seriously reduces the brightness of an image if the lens system has several components. To make matters worse, a fraction of the reflected light from the highlights of the object eventually reaches the image, where it invades the shadows and so reduces contrast. In certain cases the haze is even concentrated into flare spots and ghost images.

Glass Reflectivity Reduced

A method has now been developed for reducing the reflectivity of glass. Its principle is that the light entering or leaving a lens surface is reflected in two stages instead of all at once in such a way that the reflected components are mutually destructive.

This is achieved by applying to the surface of the glass a thin transparent film so that there shall be two parallel reflecting surfaces—the glass-film boundary and the film-air boundary. The two sets of reflected rays so generated will annul each other if they are equal in intensity but opposite in phase. They are made so, as nearly as possible, by correct adjustment of the thickness and refractive index of the film.

The method is an application of the principle of interference of wave motions. The light energy which no longer appears as reflected light is by no means lost. That would in any case be impossible, but in this case we find that it is restored to the transmitted beam with the happy result that the brightness of the image is increased.

† J. Brit. Kin. Society, Jan.-Mar. 1944.
* Brit. Scien. Instr. Res. Assn.

Figure 1 shows the action of a coating of anti-reflection film on a flat glass surface. *A'R* is a typical reflected ray and, as can be seen, it is made up of a direct reflection from *AA'* and innumerable small additions through multiple reflections from other rays of which the first two, *B* and *C*, are shown on the diagram. Similarly the transmitted *AA'T* gets contributions from the same sources.

It would take too long to work out the conditions herein, but it is a fact[1,2] that, for normal incidence, if the thickness of the film is one-quarter of the wavelength of the incident light, then all the additions to the reflected ray from rays like *B* and *C* are in opposite phase to the direct reflection from *A* and all the additions to the transmitted ray are *in* phase with it.

Furthermore, if the refractive index of the film is the square root of that of the glass, the combined amplitude of all the multiple-reflection components of *A'R* is equal to that of the component from *AA'*. As they are opposite in phase, the result is: no reflection. Under the same conditions the additions to the transmitted ray, being in phase with it, are just enough to make up for what it loses at the two boundaries of the film. (The diagram does not show all the rays to which *A*, *B* and *C* rise. Each ray is partially transmitted and partially reflected at each boundary, but the rays not shown form part of other interference systems identical with this one.)

The effect of a quarter-wave film of the right refractive index is therefore to allow a ray perpendicular to the surface to pass into the glass without reflection. The film would be equally effective if the ray were travelling out of the glass.

Without going into details, I can say that the same film criteria give almost complete elimination of reflection for angles of incidence up to about 20° so that the film is effective in converging or diverging beams and on the curved surfaces of lenses. Also, by making the film a little thicker, non-reflection can be obtained for particular angles of incidence up to 45°.

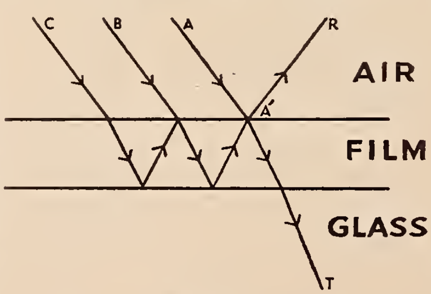


FIGURE 1
Principle of anti-reflection film

So far I have only dealt with monochromatic light. When white light falls on a film adjusted for non-reflection in, say, the yellow-green, the yellow-green component is fully transmitted and not reflected at all. For wavelengths further from the yellow-green there *is* some reflection and some reduction in transmission, but even in the violet and the red the reflection is very small. The reflected light is, therefore, a faint purple (which gives an anti-reflection film its characteristic appearance). The transmitted light is tinged with yellow-green, but this is only noticeable when the light passes through a train of coated lenses.

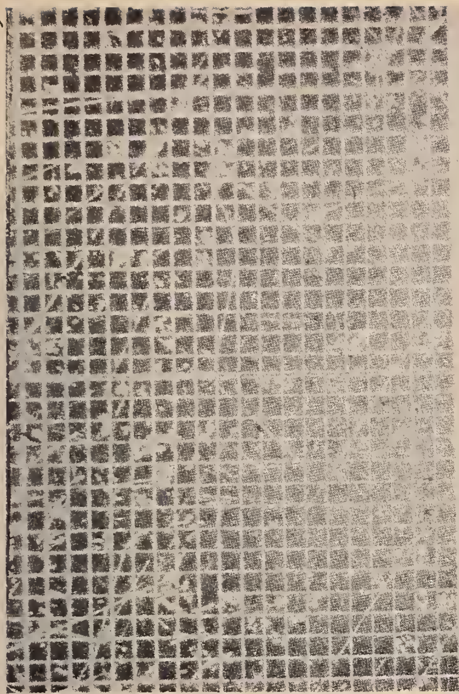
I have taken this example with the maximum transmission in the yellow-green, because such a film gives the greatest effect over the whole of the visible spectrum. If maximum transmission is required in any other region such as the violet or the infra-red, the film thickness is adjusted accordingly.

How accurately can a film be made to conform to the theoretical conditions? The answer is—nearly enough to make it worth while to apply the process on a large scale. The square-root rule governing the refractive index of the film is not very critical and the same film material can be used with good effect on all the lenses of any optical system.

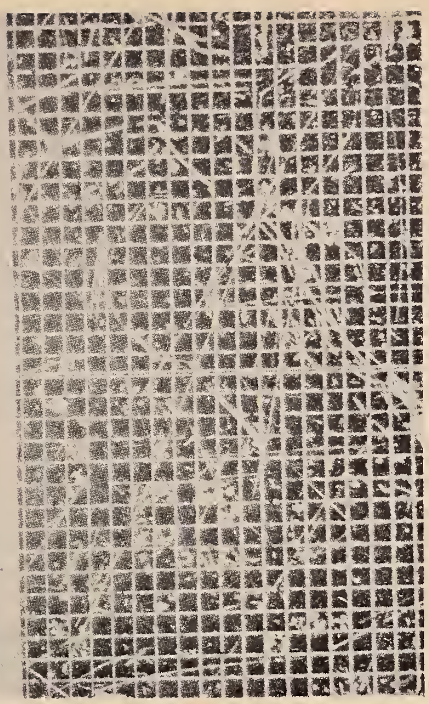
Formation of Film

Magnesium fluoride and the mineral cryolite both have refractive indices which are of the right magnitude to suit optical glasses.

Silica also is sometimes used, although it has rather too high a refractive index to suit ordinary glasses. Its advantage is that silica forms the very framework of the glass; the film can be formed by dissolving away the other constituents of the glass, leaving the silica skeleton undisturbed. The first experiments on anti-reflection films were made along these lines by H. Dennis Taylor[3] of T. Cooke & Sons, York, in the 1890's. Taylor was evidently the first to attempt to reproduce artificially the natural "tarnish" produced on lenses by the action



A



B

FIGURE 2. *Photographs of a test object taken with a 2 in. f/1.5 lens, uncoated (A) and coated (B)*

of the atmosphere, having recognized its beneficial nature.

The fluoride films are deposited by volatilization in a high vacuum.[4] In this technique, "high vacuum" means a pressure of not more than one-millionth of an atmosphere. When the mineral is heated to red heat at that degree of vacuum, it volatilizes and travels in straight lines until it meets a cool surface, where it condenses as a transparent film. To make the thickness one-quarter of the selected wavelength is a simple matter. The color of the reflection of a white light from the film can be seen to change as the film grows on the lens and the evaporation is stopped at the appropriate color. Some operators prefer to use a photo-electric measuring device. It is safe to say that the great majority of lenses being treated at the present time are coated by the high-vacuum process.

Commercially produced anti-reflection coatings should be sufficiently robust to withstand the cleaning necessary in everyday use, provided that it is done in the right way. It is very necessary to keep them absolutely clean. A thin layer of grease will completely upset the optical constants of the film.

Efficiency of Coating

In attempting to give definite figures of the improved performance of coated lens systems, I find myself in the difficult position that most of the results which have come to my knowledge are not for publication. I can, however, say that it is not unreasonable to expect the reflectivity of a single surface to be reduced to, at most, 1½%. This means an increase of about 25% in the brightness of the image formed by a camera lens having eight coated surfaces. It is obvious that reduction in glare and flare spots is greater in proportion than the increase in transmission, because glare light reaching the image plane must have been reflected at least twice. The reduction is therefore proportional to the square of the reduction of reflection at a single surface. The effect of coating a photographic lens is illustrated in Figure 2.

There undoubtedly will be a demand for coated lenses when commercial production gets into full swing again, especially for the high quality lenses, and in systems where every millilumen counts the application will be essential. Finally, the elimination of the bogey of flare spots will enable the computer to proceed with a freer hand in his approach to perfection.

[1] K. B. Blodgett, *Phys. Rev.*, 55, 1939.
[2] K. M. Greenland, *Nature*, 152, Sept. 1943.
[3] H. D. Taylor, "*The Adjustment and Testing of Telescope Objectives.*" T. Cooke, York, 1896.
[4] British Patent No. 538272.

NTS GIRLS FORM CLUB TO WRITE SERVICE MEN

A Servicemen's Letter Club has been formed by girls employed by National Theatre Supply, sponsored by W. E. Green, president of the organization. The 25 charter members of the club have pledged themselves to write at least one letter a week to a man in the service, other than sweetheart, brother, husband or relative. Each week members are supplied with the name and address of their "mail date" and a chart posted in the NTS lobby reports the progress of the club. Membership is open to all girls in National's 28 branches.

Soldiers See Movies Shortly After Combat Duty

The movies, in their contribution to bringing war up to date, have added amazingly to the morale of the armed services in all theatres of combat. In a recent report of the War Department, for instance, it is emphasized that army jungle fighters in the Pacific put aside the hard reality of combat for the pleasant make-believe of the animated screen literally within minutes of their return from combat missions.

Major-General Frederick H. Osborn, director of the Morale Service Division, Army Service Forces, who has just completed a 30,000-mile tour of the Pacific theatre, declared that motion pictures have proved an effective antidote to the tension and physical strain of battle, and that they are particularly welcome to men just returned from the front.

General Osborn's tour included "the largest motion picture circuit in history," that maintained by the Overseas Motion Picture Service of the Army Service Forces in the Pacific and proved to him, he said, that "the Pacific soldier is the most avid movie-goer in the world."

The general also noted that the distribution of first run films to the various fronts by air is on a par with any similar commercial operation, and came about "because combat officers want their men to relax after they come out of the lines. The movie has proved to be the solution."

Army Service Forces distributes films in rotation to the combat areas, after which they are routed to supporting units farther in the rear. Also given high priority for early showings are the wounded in hospitals.

A soldier likes to see pictorial views of streets that remind him of his home town, of people he might meet on the streets; of women to remind him of his mother, his wife, his sweetheart; of ordinary happenings in which he again will participate. General Osborn said that "this tremendous movie chain's value as a good will factor is beyond computation. In New Guinea, for example, where Australian and American soldiers fight side by side, they sit down to see an American film side by side."

BELL AND SCOVILLE HONORED FOR MOVIE SOUND PAPER

William L. Bell and Ray R. Scoville, sound engineering experts of the Bell Telephone Laboratories, were the recipients of the Annual Journal Award of the Society of Motion Picture Engineers at the 55th semi-annual technical conference at the Hotel Pennsylvania, New York, last month. The award was made in recognition of their joint paper on "Design and Use of Noise-Reduction Bias Systems." The award is presented each year to the author or authors of the paper judged best in point of clarity, breadth of interest, and importance of material among those published in the Society's official journal.

Drive-In Theatre of the Future Discussed at SMPE Meeting

IN DISCUSSING "Some Factors in Drive-in Theatre Design" before the 55th semi-annual Society of Motion Picture Engineers conference in New York last month, L. H. Walters, manager of the Cleveland branch of National Theatre Supply Company and head of the newly formed Drive-in Theatre Equipment Division, declared that the first drive-in theatre of modern type was opened in 1933 and in the eleven years that have elapsed since that time activity and construction of drive-in theatres has gained considerable momentum. Only yesterday, he said, drive-ins were in the experimental stage and looked upon as something of a freak, but they are beginning to prove themselves an important part of the industry.

If it were not for war restrictions, he continued, many more drive-ins would be in operation, with considerable evidence seen of interest among a number of groups for building drive-in theatres after the war, with many sites chosen and plans drawn. Discussing the problems of design and construction, Mr. Walters stated that since the first drive-in theatre was opened a considerable amount of information and experience has been gathered which will prove valuable in the post-war era.

"In the design of a drive-in theatre," he said, "the selection of the site, of course, is the first step and is of utmost importance as the success or failure of the project hinges upon the theatre being properly located. Accessibility to highways must be placed at the head of the list for the same reason that when an indoor theatre is built, it should be located where the traffic is heaviest.

"Once the site of the drive-in theatre has been selected the location of the screen tower is important. The screen surface should not face the west because in certain localities the sun sets at such a late hour that it necessarily would affect the time at which the performance could commence and, of course, thereby affect the financial success of the venture.

Screen Tower Design Important

"The design of the screen tower is significant in that its height is determined by the size of the picture image, keeping in mind that good sight lines have to exist for each ramp and a fair margin of black must be allowed for masking the screen. Furthermore, the tower itself is subject to considerable wind pressure and weather conditions and the larger it is, the more important its construction becomes. At the same time, in general—the screen tower is located, if possible, near the highway and advertising is displayed on the rear of the tower which is desirable if practical. In fact, the general design of the theatre is to a large extent governed by the design of the screen.

"Most of the drive-in theatres built in the past have used a motion picture screen 30′ x 40′ in size and have had about 10 ramps. This size screen has proven to be quite satisfactory for this number of ramps. If additional ramps are required, the width of the picture image should be increased 5 feet for each additional ramp.

"The success of the drive-in obviously stands or falls on the quality of its sound. A great deal has been learned about the type of sound systems most satisfactory for this type of theatre. In certain localities it has been found that the use of large loudspeakers at the screen was not satisfactory due to the proximity of houses whose occupants were disturbed by the 'spill-over' of reproduced sound. Where the site for a drive-in theatre has been selected and this condition exists, the only satisfactory alternative is the use of individual loudspeakers. Up to the present time, two general types of individual loudspeakers have been used; one of which is permanently mounted so that occupants of cars can listen to them through open windows—and the other is hung on the door of the car.

"In the selection of either the large loudspeakers or the individual loudspeakers, it is of course important that a type be utilized that will reproduce not only sound of sufficiently good quality, which is quite a problem in the case of the individual speakers, but also properly distribute the sound over the area required. It is anticipated that immediately after the war new and improved types of loudspeakers, will be introduced for drive-in theatres which will assure the patrons perfect enjoyment of the show and eliminate the possibility of 'spill-over' sound annoyance in communities where houses closely adjoin the theatre.

"Best projection results may be obtained by utilizing the latest type of projection lenses which are treated lenses of F.2 speed. In view of the fact that up to the present time projector mechanisms have not accommodated lenses of this type with the focal length in excess of 5 inches, it is desirable to lay out the theatre in such a way that the projection room be within the range of the screen which will permit the use of the treated F.2 lenses for the particular picture image size selected.

"As a result of experience to date for drive-in theatres with a car capacity up to 600, projection equipment consisting of double shutter projector mechanisms, treated F.2 lenses, high intensity positive condenser type arc lamps operating at 125 amperes or simplified high intensity arc lamps using metal mirrors and operating at approximately 70 amperes are recommended. For larger theatres, the use of the high intensity lamphouses with quartz condensers is more desirable.

"In drive-ins, electrical wiring requires special treatment not necessary in indoor theatres. It is quite important that all electrical wiring be mounted on the ceiling and walls above the ground level of the projection room so as to eliminate the possibility of water getting into the conduit and causing short circuits. Amplifiers, sound changeovers, etc., should be mounted on special insulated backing to eliminate the possibility of short circuits and grounds from moisture—prevalent in most drive-in theatres. All underground wiring should be Parkway Cable or lead covered and all joints should be insulated with tar. In fact, we recommend the use of conduit wherever possible with the same treatment. Motor generator sets or rectifiers should be mounted in a room on a level above the ground to guard against damage from poor drainage.

"Up to the present time most drive-in theatres have utilized motion picture screens consisting of flat white paint on a wooden surface. The use of this type of screen has been due to the fact that they are exposed to varying weather conditions. It is relatively simple after the screen has become streaked from rain storms to repaint it during the season.

"Large loudspeakers when used have always been placed above the screen. It is hoped that in the post-war period a plastic screen, which will permit a higher quality projection, will be made available and will be impervious to weather conditions to which drive-in theatres are subjected. This screen will be of a type which can easily be restored by the use of a chemical cleaner."

In conclusion Mr. Walters said that there appears to be every indication that in the years immediately following the war at least one drive-in theatre will be constructed in every good size town and city in the country.

HAGGERSON ELECTED PRESIDENT OF UNION CARBIDE

Ralph R. Browning, Paul P. Huffard and Homer A. Holt were elected members of the board of directors of Union Carbide and Carbon Corporation at the annual meeting of the organization. Mr. Browning has been associated with units of the corporation for 31 years and Mr. Huffard for 35 years, and both have been vice-presidents since 1939. Mr. Holt is a Charleston, W. Va., attorney and is a former governor of the State.

At a later meeting of the board of directors Fred H. Haggerson, vice-president and director, was elected president, succeeding Benjamin O'Shea, who became chairman of the board. Mr. Haggerson has been with the organization for 25 years.

IN THE SPOTLIGHT

(*Continued from page 17*)

members. Several hundred members of Local 306 and guests attended the dinner, which, incidentally, broke up at five o'clock the next morning. Lester Isaac was master of ceremonies at the occasion and handled his duties in his usual capable manner. At the speakers' table were Bert Ryde (Buffalo), Mike Rosen, P. A. McGuire (N.S.B.), M. D. O'Brien, Solly Pernick and Major Thompson.

Among those present were Harry Rubin, Dave Garden, Sam Kravitz, Harry Storin, Mike and (son) Milton Berkowitz, Eddie Abrams and yours truly. RCA Service Company was represented by W. F. Hardman, Walter Wahl, and Nat Ripp. Bert Sanford and Lane Patton represented the Altec Service Corporation.

Kravitz was presented with a beautiful oil painting of his son who is serving with the armed forces in one of the combat zones.

● Gene Atkinson, newly elected business agent of Chicago Local No. 110, has started a ball rolling that will not stop once it has reached its momentum. He has advised the theatre owners in Chicago that Local 110 is determined to have two-man operation in each projection room, and our money is on Gene. To date both Atkinson and Clarence Jalas, his assistant, have succeeded in winning pay increases for the projectionists in several of the smaller type theatres. This is just a beginning, but we have high hopes that the team of Atkinson-Jalas will prove instrumental in bringing back the two-man shift in every projection room in Chicago. Good luck, boys.

● *Shadows forecasting coming events:* Solly Pernick, business agent of State Hands Local No. 1, New York City, has successfully negotiated a five-year contract with the Columbia Broadcasting System for its television studio in the Grand Central Terminal Building. Pernick has already placed three of his members in the studio as heads of departments.

● Sam Picinich, treasurer for the past 26 years of Local No. 293, New Orleans, La., stopped at our offices to pay us a visit on his recent trip to New York. Sam, accompanied by Mrs. Picinich, witnessed the graduation of his prospective son-in-law from the Massachusetts Institute of Technology. His son, Marion, is a medical student at Tulane University.

● Signing off—hope to see many of you at the St. Louis convention. Our headquarters will be the Statler Hotel. Look us up.

SIMPLIFYING ANALYSIS

(Continued from page 9)

vides a path for the fluctuating speech current: and that is how the speech current is passed along from one tube to the next. (Of course every circuit has two sides; in the case of Figure 12 the other side of the speech circuit usually is composed of the grounded cathodes of the two tubes. The present article is not devoted to tracing circuits, but to identifying common combinations used in amplifier drawings.)

Figure 12 may be modified in a number of ways, by combining it with Figure 8, for example, in which case the sliding contact would be applied to the right-hand resistor of Figure 12. Tone control devices may sometimes be included, and partially disguise Figure 12 as it is seen in amplifier drawings. However, the reader may be helped by remembering that if there is more than one stage in the amplifier, and if no transformer is drawn between the stages, then Figure 12 or its equivalent MUST exist; if it is not readily seen in the diagram, its presence is disguised by some small variation. In addition to the variations mentioned a minor difference, not very widely used, consists in substituting a choke coil for the left-hand resistor of Figure 12. And, of course, Figure 12 may be modified by inclusion of parallel plate feed as in Figure 6.

The reader may have noted, incidentally, that the greater part of a complete amplifier is diagrammed in these twelve drawings. For example, Figure 11, connected to the output of Figure 1, would represent a complete *B* supply for an amplifier, less only the rectifier itself. The lower end of the lower resistor of Figure 2 would connect directly to one of the output leads of Figure 11. Figure 2, of course, can be substituted for the plate portion of Figure 3; and then if the left-hand segment of Figure 8 is substituted for the grid portion of Figure 3, one complete stage of amplification, with its *B* and *C* voltage supplies, will have been represented. If Figure 4 were then added (with the help of a coupling transformer) and if the wire running downward from Figure 4 were connected to one of the other outputs of Figure 11, a two-stage amplifier, with pushpull output, would be considerably more than half drawn in detail.

The combinations here shown are those most commonly used in modern amplifiers, and most of them appear in the drawings of most amplifiers. Facility in recognizing them *as* combinations, without necessity for stopping to trace each part and connection singly, will greatly aid the study and the use of amplifier diagrams. The projectionist who learns to approach his amplifier circuits in this way will be reading words, instead of spelling them out letter by letter.

ALTEC SERVICE CONTRACTS

Altec Service Corporation has closed a contract with Associated Theatres covering service and maintenance for their theatres in Meridian, Greenwood and Gulfport, Miss. Another contract has been signed with the Strand Enterprises, Inc., Memphis, Tenn., to provide service, sound R & R and booth R & R to their twenty theatres in Tennessee, Mississippi and Arkansas.

WRIGHT NEW W. E. DIRECTOR OF PUBLIC RELATIONS

Fred B. Wright, an executive of Western Electric Company's nation-wide distributing organization, has succeeded Philip L. Thompson, as director of public relations for the company. Mr. Thompson retired under the organization's pension plan on April 1, after 41 years of service.

TELEVISION TODAY

(*Continued from page* 14)

involves differences in the speed of transmission of the different frequencies. To correct this, delay networks were introduced to equalize the transmission speeds over the entire frequency range. Only thus will all the picture details appear in the same relative position in the reproduced as in the scanned picture.

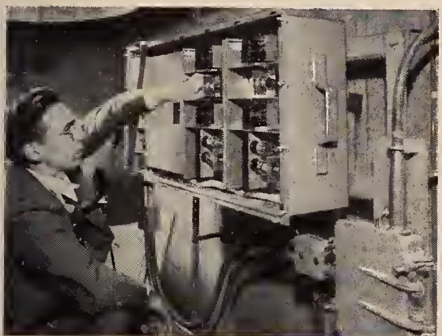


FIGURE 46
Coaxial cable repeater amplifier in manhole

Since the coaxial cable does not offer sufficient shielding for the very low frequencies, it is necessary to translate the original television signals upward in the frequency spectrum to place them in a range above that of the region of disturbance. Through the use of a "carrier" frequency the useful frequency band is placed between approximately 120 and 950 kilocycles, permitting a band of over 800 kilocycles. This also permitted the transmission of television signals with 240 scanning lines with 24 frames per second. The frequencies below 120 kilocycles and at 1024 kilocycles are used for pilot frequencies, synchronizing carriers, carrier, order wire channel and sound program channel. In addition, 60-cycle power is transmitted to operate the repeaters.

The use of 240-line scanning, with 24 frames per second, deviates considerably from the figures of 525-lines and 60 (interlaced) frames per second which are now standard for television. Since the principal problems of transmitting television signals over wires has been solved, the problem now is to design a coaxial cable that will transmit a frequency band of nearly 6 megacycle width efficiently.

Again quoting from the letter written to NBC by the telephone company: "The equipment now developed will give a one-way television channel of 2.7 megacycles in width. Future technical developments will increase this to 4.0 megacycles and also provide for simultaneous use of a single coaxial unit to transmit a television channel and a large number of telephone channels. Consequently, the ultimate number of television facilities which could be provided over these cables will be considerably greater than the initial number. Depending upon the speed of growth of the television industry, it may be necessary for users to do some sharing of television network facilities for a few years."

The tentative program of coaxial cable routes of the Bell System are: 1945, New York-Washington; 1946, New York-Boston, Washington-Charlotte, Chicago-Terre Haute-St. Louis, Los Angeles-Phoenix; 1947, Chicago-Toledo-Cleveland-Buffalo. Southern Transcontinental Route including Charlotte-Columbia-Atlanta-Birmingham - Jackson - Dallas - El Paso - Tuscon-Phoenix; 1948-50, Washington - Pittsburgh - Cleveland, St. Louis - Memphis-New Orleans, Kansas City-Omaha, Des Moines - Minneapolis, Atlanta - Jacksonville-Miami, Los Angeles-San Francisco.

Thus the future for the creation of television networks to stimulate and insure the success of television in the post war period seems assured.

[1] This radio relay system was in operation until 1942 when it was closed down in accordance with war regulations.

Tips On Conservation of Ball Bearings

By *EDWARD STANKO*
RCA SERVICE COMPANY, INC.

THE freezing up and rough running conditions experienced with ball bearings are sometimes due to cheap greases used for lubrication. Greases which develop free fatty acids from their soap bases will bring ahout this condition. In many cases, inferior greases, carelessly manufactured, contain a considerable amount of moisture which further increases the danger of staining and corrosion due to the fact that this moisture becomes acid either as a result of the soap base breaking down to free fatty acids, or, as in some cases, due to contamination from outside sources.

A common source of trouble with ball bearings may be traced to electrolysis. Any two dissimilar metals in the presence of a material which would serve as an electrolyte (as many greases do), will produce a small flow of current which aids in producing breakdown and corrosion. This condition is noticeable on ball bearings used with bronze separators. When, for some reason or other, this electrolytic action sets in it always produces a change in the grease itself, as well as in the performance of the bearings, for the grease, serving as an electrolyte, is broken down at a higher rate and becomes its own destroyer as well as that of the bearings with which it is used.

Contamination of greases and oils used in the projection room may be caused by the arc itself. Arc lamps, as a general rule, create a great deal of ozone. Therefore, if the arc is maintained within an enclosure which contains machinery lubricated by oil or grease, the ozone is brought into intimate contact with these luhricants. Ozone is a rapid oxidizer of all lubricants, causing even the better grade greases to break down much more rapidly than they do when operated in an atmosphere free from ozone.

During the present emergency when bearings are very difficult to obtain and replacements are rather expensive, the greases and oils used for lubricating purposes in the projection room should be of the best quality obtainable. It is also suggested that greases and oils be stored outside of the projection room so that they do not come in contact with the ozone generated by the arc lamps.

AT YOUR SERVICE

(*Continued from page* 18)

stud and the tap hole carefully with carbon tetrachloride. Apply to the stud and into the hole a paste of "Smooth-On No. 1," which may be obtained at any hardware store. After the paste has become "tacky," screw the stud into the hole as tightly as possible, using the lock washer. Preferably, this should be done at night after the show in order to give the cement a chance to set. The most essential feature of this method of repair is to make the parts absolutely clean *before* applying the "Smooth-On." —M. BERGER, *ALTEC*.

Patching Acetate Film

In case you are caught short and do not have the necessary patching cement for acetate film, a very satisfactory splice can be made by inserting two sprockets of nitrate film. Ordinary cement will join the acetate to the nitrate film.—F. H. JENNINGS, *ALTEC*.

Belt Substitution on W. E. 209-Type Reproducer Set

The Gates Vulco 1370 "V" belt may be used with excellent results on equipment using W. E. 209-type reproducer sets.—F. M. WALLS, *RCA*.

Removing Burned Film

I was surprised to learn it is not generally known that burned film can easily be removed from the machines with hydrogen peroxide.—F. W. CONCKLIN, *ALTEC*.

Static Sparks from Rewind Machine Create Fire Hazard

By *THEODORE DRAHORAD*
L. U. 306, NEW YORK CITY

MANY projection room fires are caused by the careless use of the film rewind machine. This hazard may be lessened to a great extent by just a few precautionary measures on the part of the projectionist.

I know many projectionists who just by adding a motor and pulleys to their hand rewinders converted them into motor-driven machines. However, they gave no thought to the speed of both the drive spindle and the film as it passes from the unwinding reel to the winding reel. They failed to take into consideration the fact that when film is rewound too fast a static charge is created causing sparks to jump between the film and reel.

At speeds where the spindle turns over 1,000 revolutions per minute the charge and discharge, under the right conditions, can and often do have disastrous results. In some cases the speed of enclosed rewinders which are intended to have a spindle speed on drive side of not more than 300 revolutions per minute is increased considerably by changing the pulleys or by the substitution of a higher speed motor.

Then there is the projectionist who examines the film while it is on a motor rewinder, not realizing that he is building up another static charge in his body which, in turn, creates a spark between the fingers and the film or reel. When film is examined on a hand-rewinder, the hand turns the crank slower as the take-on reel gets larger, and the film passes through the fingers at about the same speed from beginning to end.

On the other hand, when film is examined on a motor-rewinder and the drive spindle runs at 300 revolutions per minute, about 300 feet of film per minute passes through the fingers at the beginning of the rewind on a reel with a 5″ hub. As the film is added to the reel the speed is increased and at 2,000 feet (14″ in diameter) about 1,100 feet of film per minute passes through the fingers. Naturally, the static created by this speed is increased and a heavy spark is bound to result. Film should not be examined on motor-driven rewinders unless the speed of the winding film is kept down low enough to avoid a heavy static.

Then there is the enclosed rewinder with a roller arm that rides on the film and has a roller on ball bearings, which are often dry and are the cause of static discharges and sparks between the balls in bearing raceway. This trouble may be eliminated by greasing the bearings.

Sparks may also be caused by badly bent reels hitting the sides of enclosed rewinders when running at high speed.

In many projection rooms the motor rewinder is not grounded but is attached to a rewind table with a non-metallic top. Should the motor develop a ground, and if in removing a reel of film it touches the rewinder and a metal conduit, it definitely will cause a heavy spark. In some cases these sparks cause instantaneous fire while in others a spark may fall between layers of film causing it to smoulder until the air hits it, at which time the reel will burst into flames either while it is in the film storage compartment or when it is taken out to be threaded into the projector. Even when these sparks do no immediate harm, they always are a potential source of danger.

LETTERS TO THE EDITOR

Movies "Down Under"

Mr. Harry Sherman
Editor, In the Spotlight
Dear Mr. Sherman:

I have been a reader of International Projectionist for the last five years and have looked forward each month to your column since its inception, several years ago. Your zealous efforts in behalf of labor, two-man projection rooms and rigid fire laws have been real heart-warming reading to me.

Although not a member of Local No. 150, Los Angeles, Calif., I was, prior to entering the army (and still am, incidentally), desirous of becoming a member of the I. A. T. S. E. While "waiting my turn" I worked, with the sanction of Local 150, for a large non-union circuit of theatres in the Los Angeles area, doing what I could to swing the circuit into the union. It was shortly before this goal was reached that I was inducted into the army. However, even though I played but a small part in this achievement, it was indeed gratifying to learn of the success of the I. A. in signing up this circuit and to know that my efforts had contributed somewhat in the completion of a task which had been hanging fire for a number of years.

My experience in projection and sound engineering soon ushered me into the task of specializing in communications, and shortly thereafter I was commissioned a second lieutenant and shipped overseas. My new assignment was as a Regimental Communications Officer for a combat unit. My job was to install, maintain, and operate all military communications—radio, telephone, teletype and telegraph. My assistants consisted of three officers and a number of enlisted men.

I soon learned that things in a combat zone in the Southwest Pacific aren't as easy as they are in the States. It wasn't the Japs that gave us the most trouble—it was the weather. New Guinea has a hot sultry and constantly humid climate. Jungles, swamps, and tropical rainstorms cause excessive rusting, corroding, and various forms of annoying hindrances. Green mold, such as collects on bread, gathers overnight on wiring, rubber, leather, and whatever else may be unprotected. Condensers and resistors are most susceptible to this climate. Maintenance of equipment was a problem.

Hardly had I begun my new job when the Colonel called me in and with my record on his desk in front of him, said, "In addition to your other duties will you see if you can straighten out our movie situation? It is a mess!" The "straightening" out was quite a task. The equipment, other than the 16-mm, was of German make. I didn't know beans about it but I figured that basically it was the same as U. S. equipment, so I set to work. Without manuals, aids, or guides (my assistants and I) learned the hard way, but we learned, and today I wouldn't trade that experience for anything. We soon had the "booth" running smoothly and giving a good performance.

I was too busy getting the equipment in shape and trying to give the boys as good performances as possible, to notice the effects of the movies upon the "customers." However, I soon realized that here, in New Guinea, motion pictures play an extremely important role in keeping up the morale of the men. In a combat area (which is anything within bombing range of the Sons of Heaven) there are no women, no cokes, no ice cream—just the necessities. The Red Cross does all it can to help entertain the men but they soon get tired of playing ping pong and checkers. It falls to the movies to provide at least 90% of the diversion and recreation that fighting men need. A man who works or fights for weeks on end wants relaxation and recreation when he returns from the front for a breathing spell.

Despite the weather which wreaks havoc on the equipment, we put on our shows every night, rain or shine. The men will begin to assemble in the open air theatres long before dark, to await the show that begins as soon as it gets dark enough. I have seen American men walk *four miles* in a pouring rain through knee deep mud to see a movie. They bring boxes, chairs, stools and cans to sit on—and will patiently sit in a drenching rain waiting for the show to commence. Our shows play to about 6,000 men nightly in our outdoor hillside theatre. I have yet to see a single man get up and leave because of the rain, and it is indeed an impressive sight to see 6,000 men so eager to see a show.

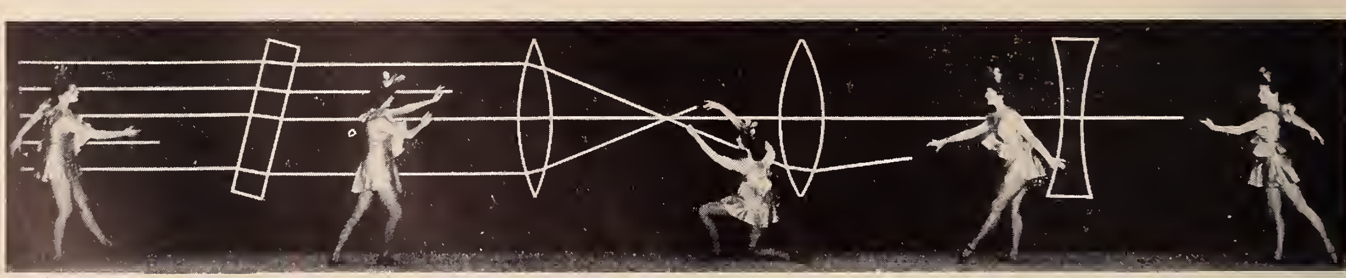
On the clear nights when the Jap planes come over, we just stop the show and when they are gone and the all clear sounds, we continue where we left off. Nobody leaves. A breakdown that cannot be repaired is cause for real tears.

The films we see, donated by the motion picture industry without cost for overseas forces, are a real blessing and the service the industry renders will not be forgotten. Yes, theirs is a priceless service.

Projection equipment here in the forward areas is mostly 16-mm. Both equipment and films are overtaxed—overworked. Even if the number of prints arriving here each month were doubled, it would not fill the demand. Films are shown over and over again until they are worn to shreds. By snooping and scouting around I located several good ex-projectionists and they have proven themselves invaluable.

Well, so much for the efforts of the craft in this location. I hope I didn't go off the deep end in emphasizing the value of motion pictures out here. To put it mildly, their worth is priceless and when our fighting men return home they will look with a grateful eye upon the craft and industry that brought them so much pleasure in their time of need.

Cordially,
John N. Brewer,
2nd Lieutenant,
Army of the United States



A novel feature of the elaborate stage production produced by and for the employees of Bausch & Lomb Optical Company was a ballet number entitled "Bright Miracle," which dramatized the science of optics. On a blacked out stage, the dancers, with fluorescent ribbons, traced the paths of light rays through various lens forms. At the end, a white ray traversed a prism and dispersed into a brilliant spectrum.

Motion Picture Film Regulations of the Underwriters Code

This is the third installment (with a few deletions of matter of no interest to I.P. readers) of the regulations of the National Board of Fire Underwriters anent the handling and storage of nitrocellulose motion picture film. Regulations apparently applying only to studios, film exchanges, laboratories, etc., also apply to theatre projection rooms whereever processes or conditions are similar.

237. *Shipping Room.*—(a) The shipping room shall be separated from the rest of the building by partitions constructed in accordance with the provisions of sub-section 112. No other process than packing of film shall be conducted in the shipping room.

(b) Not over 500 standard rolls of film shall be in a shipping room at one time, of which the quantity not in shipping cases shall not exceed 250 standard rolls. See sub-section 181.

Motion Picture Studios

241. Buildings housing motion picture studios shall be completely equipped with automatic sprinklers, except that upon specific approval of the inspection department having jurisdiction, sprinklers may be omitted in rooms of a construction having a fire retardant classification of not less than one hour and used only for housing valuable electrical equipment and in which no film or other hazardous materials are handled or stored.

242. (a) On the studio stage there shall be no film except in the magazines of cameras or sound recording apparatus of which there shall not exceed two magazine units for each camera or recording apparatus. In other sections of a motion picture studio the quantity of film not in containers shall not exceed one standard roll per person handling such film.

(b) Extra, loaded magazines may be kept in a special magazine room. The number of loaded magazines in one such room shall not exceed 50 They shall be kept on open metal racks. Such rooms shall be used for the loading and storing of magazines only.

(c) In all sections of a motion picture studio other than the stage and magazine rooms, the quantity of film in a room shall not exceed 10 standard rolls per person handling film, in addition to what may be kept in cabinets.

(d) All film in excess of the quantities permitted above shall be kept in cabinets or vaults.

343. Vaults and/or cabinets shall be located in a section separated from the studio stage by partitions.

244. Sections of a studio in which the work is of the same general character as that in a laboratory shall be governed by the provisions of Section 23 Laboratories.

245. (a) Carpenter shops, property storage rooms, costume rooms, and dressing rooms shall be separated from the studio stage by fire partitions constructed of 8 inches of brick, or of some other construction of incombustible materials and suitable stability, having a fire retardant classification of not less than 2 hours as determined by the Standard Fire Test.

Panic and Its Control

By *WALTER CUTTER*
NEW YORK UNIVERSITY

The accompanying article, part of a treatise published by the National Conservation Bureau, is a working guide giving certain general indications of some of the causes and possible controls of panic. It is a subject of particular interest to projectionists, who are intimately concerned with the problems of safety in the theater.

PANIC is a sudden and overpowering fear which affects both individuals and groups. It reaches its greatest possibilities for danger to many when it affects groups. Panic can be described; many of its causes are known; but, seemingly, it cannot be wholly explained. What will set it in motion, when and where it will occur, how widespread its effects will be, cannot be completely known. It is sufficient to say that the major underlying cause is man's fear that his life is threatened. Since the will to survive, often called the instinct for self-preservation, has been termed the strongest urge in man, it is only natural, in the face of danger, the nature of which he may or may not know, that a man may not act normally. His chief desire is to get away from the danger.

From the many possible causes of panic which might be mentioned, the following are noted as the leading ones, but are not set down in any order of relative importance:

Chronic Anxiety. The "anxious" type is often the first to "break" in an emergency.

Fear. Fear is universal. Under many conditions it is healthy. Panic fear is fear beyond reasonable controls. Fear of darkness; fear of silence; fear of loud noises which do not have an immediately assignable cause; fear of fire; fear of "aloneness" when companionship is needed: all these are constituent parts of a feeling which can send otherwise normal persons into a panic.

Instantaneous Occurrences. Cloudbursts, floods, flash fires, fights, and many other happenings of a similarly critical nature, occur with such rapidity that man's ordinary reasoning processes are suspended. A false alarm, such as the unwarranted cry of "Fire!" may precipitate panic. Under such circumstances, man's desire is only to escape.

Fire. Fire, naturally, is a chief cause of panic fear. Smoke, without visible fire, is almost as bad. No group should even be allowed to enter any place of assembly until there has been a thorough check-up of the entire premises. Inspection of occupied premises should be constant.

Panic in an individual, who is alone, frequently limits its bad effects to himself. Put that same individual in a group and we find his panic spreads like a speedy epidemic. Panic in groups is panic in its most potentially harmful form. Also its effects are intensified by the number and types of people affected.

Panic in Groups

Types of groups are of great importance in considering the possibilities of panic. A "neighborhood" group, in a church, movie, at a club, or in an auditorium, is, all things considered, less likely to get panicky than a group composed mostly of persons who are strangers to each other. In the neighborhood group, there is considerable reinforcement in the sight of friendly faces. There is a feeling of mutual support. A person trying to suppress a panic would have known elements on which to depend.

In the "downtown" group, where persons are strange to each other, it is all too often a case of every man for himself. A man, among strangers, will do things that he would never dream of doing among acquaintances and friends.

One more factor, of considerable significance in preparations to avert panic, is the effect on possible panic which a present experience may have. For example, an audience in a theatre, or an auditorium, or a night club, would, in general, be less likely to get panicky if an amusing show, with fast action and frequent laughs, was going on. If an emergency did develop, a skillful manager could take steps to remedy the situation, *before anyone knew anything was wrong.*

Let us suppose, however, a tense drama on the stage or screen, or a solemn sermon in church, or even a "blues" song in a night club. Here the groundwork for panic might be present, which one little episode would touch off. Human precautions for panic avoidance should be redoubled at such times. It is easy to see how an audience, many of whose members have relatives or friends in the service, might react to a tense war picture.

From the foregoing brief review of the nature and cause of panic, one can see that it is a complex subject. It is so complex, in fact, and its possibility so universal, that many believe that not too much can be done about it. To a degree, this is true. Not much can be done, by the time panic has passed a certain point. The success of controlling panics is measured by success in preventing them. The best panic is the one which never happens. Nothing which can be done to avert panic should be left undone. Remember Cocoanut Grove!

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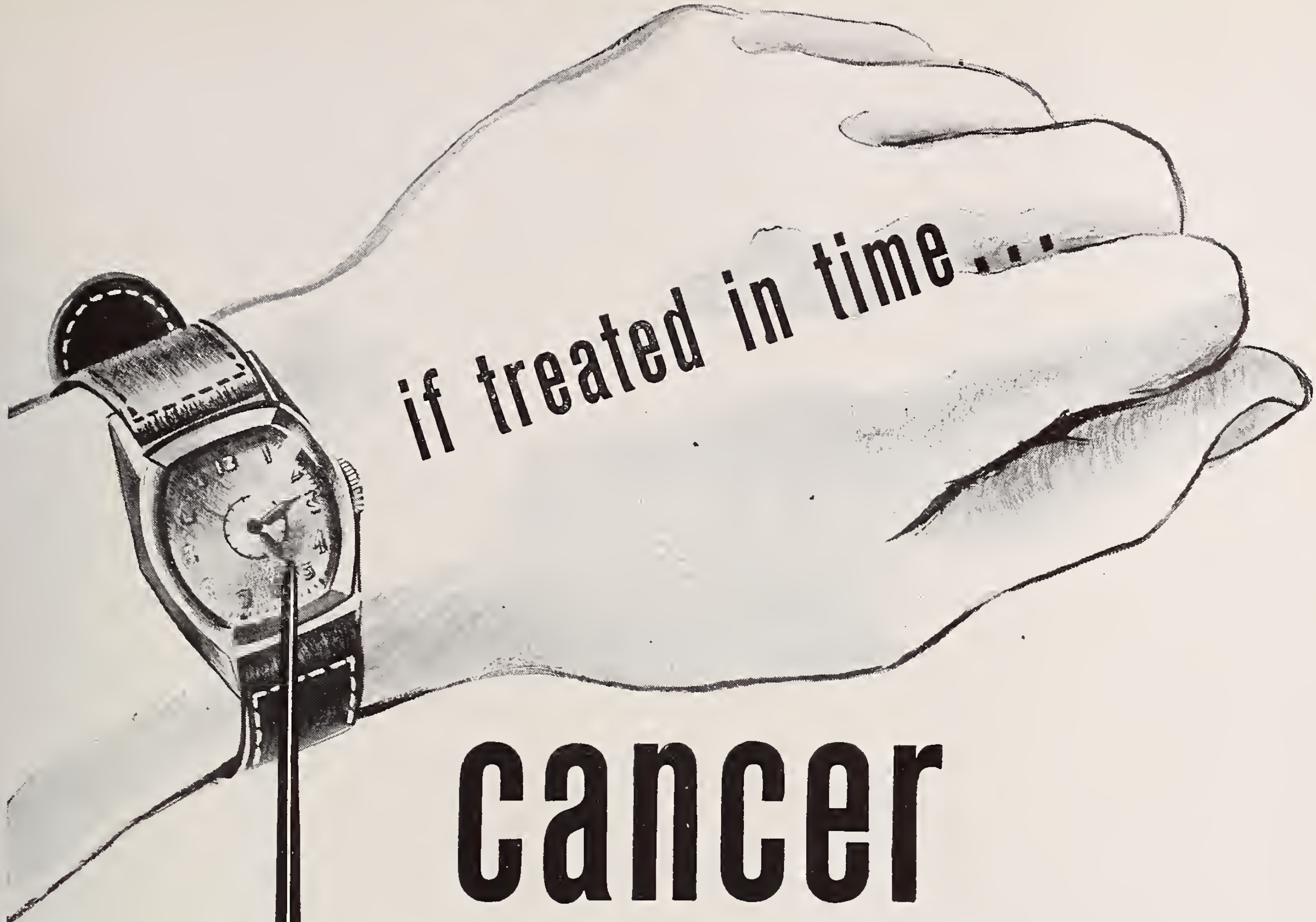
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Sydney, Australia

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For as truly as the theatre is the greatest instrument for morale in this war—so also is Simplex the heart of the show wherever exhibitors appreciate the importance of better projection.

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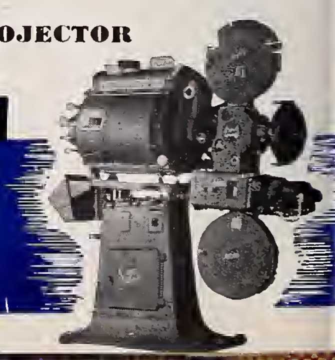

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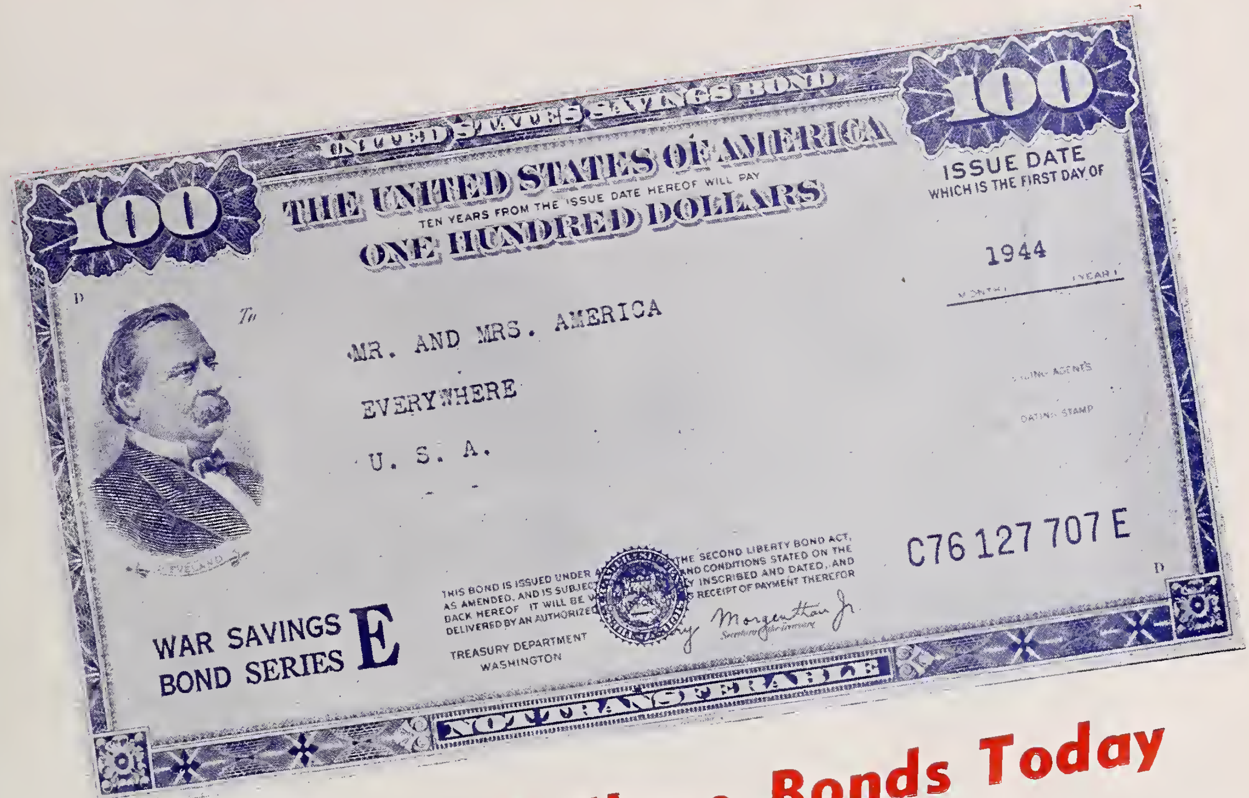

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JUNE 1944

VOLUME 19 • NUMBER 6

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Announces

completion of entirely new designs of sound reproducing systems for its foreign customers —powerful equipments for larger theatres and excellent small ones for smaller houses.

Superior to any pre-war models, these new systems will be more economical to install and operate—will be priced favorably for all users.

They are designed to take new developments which Hollywood may adopt such as automatic volume control, multi-track or stereophonic sound—*without* extensive and expensive factory or field modifications.

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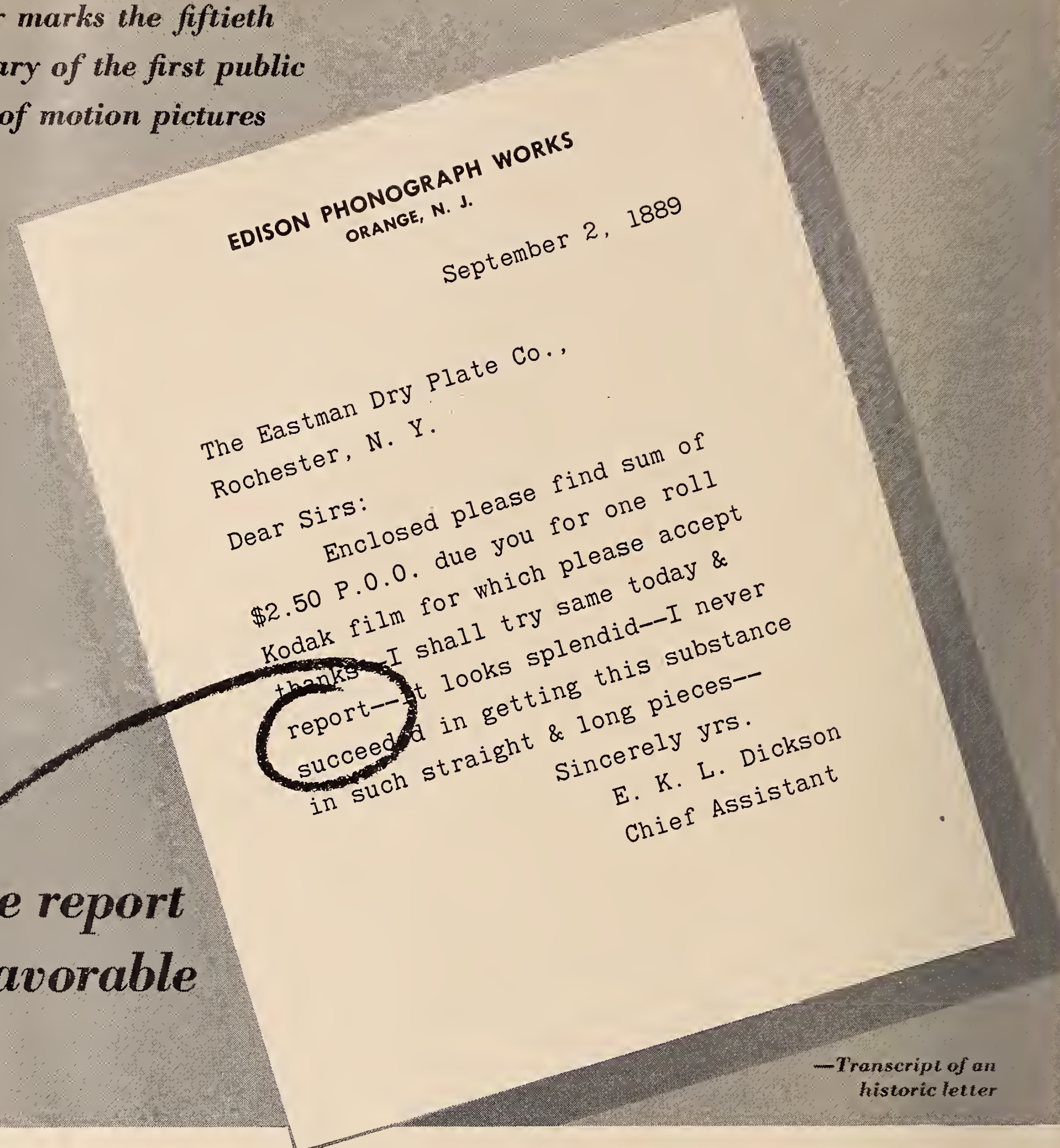
Western Electric Export Corporation

111 EIGHTH AVENUE, NEW YORK 11, N. Y.

This year marks the fiftieth anniversary of the first public showing of motion pictures



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ORANGE, N. J.

September 2, 1889

The Eastman Dry Plate Co.,
Rochester, N. Y.

Dear Sirs:

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Sincerely yrs.
E. K. L. Dickson
Chief Assistant

—Transcript of an historic letter

. . . the report was favorable

THIS $2.50 transaction in 1889 led up to the first public exhibition of motion pictures in 1894. With the help of this roll of Kodak Film, Mr. Edison and his associates were able to perfect the Kinetograph, the camera, and the Kinetoscope, the projector—the first practical motion picture equipment.

EASTMAN KODAK COMPANY

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J. E. BRULATOUR, INC., *Distributors*
FORT LEE CHICAGO HOLLYWOOD

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

ALERT PROJECTIONISTS know that after the war they will be called upon to operate and maintain television equipment and. in keeping somewhat ahead of the times INTERNATIONAL PROJECTIONIST soon will start a series of articles on basic radio. These articles actually will be in the nature of lessons. written by an authority who is now teaching the subject to many projectionists. Those who are not able to take advantage of a school room course will find that I. P.'s lessons will give them excellent coverage on fundamentals and, as the course progresses, on the up-to-the-minute advances in the new art. The author's first hand experience in working with projectionists gives him full understanding of their needs. I. P. believes that inauguration of this course will mark another milestone in its educational work in the industry.

• • •

From all accounts, and particularly from those of I. P.'s Harry Sherman, the thirty-seventh convention of I.A.T.S.E. in St. Louis, May 29-June 2 was outstanding over the long record of national gatherings. Mr. Sherman was on hand at the formal sessions and, in addition, with a figurative ear to the ground, he gleaned additional information of craft-wide interest from the lobby gossip and other informal gatherings. His reports on the convention in this issue are of great interest. For ourselves we feel that H. S. did an outstanding reportorial job and we are sure every reader will agree with the conclusion.

Accomplishments of the convention itself were many. The fiscal position of I.A.T.S.E. was shown to be in the best position ever attained. William Green, in an outstanding address, graphically portrayed the importance of organized labor in the war effort. And, to all the officers who will guide the organization during the next two years, I. P. extends its congratulations and assurances of support.

• • •

Full support of the Fifth War Loan Drive, which started on June 12, has been pledged by the entertainment industry. This was to be expected, for no other industry has exceeded the efforts of the entertainment world in aiding to the success of the war drives. Foremost in the field is the motion picture division, which has mobilized itself to an even greater extent than in previous drives. Everyone knows that the $16,000,000,000 goal must be exceeded—and it will be exceeded. When the history of this Fifth War Loan Drive is written, the movie world will be proud of its individual record, and America will be proud of the industry that has given so much so wholeheartedly to the common goal of Victory.

Soldiers crowd around the portable screen to see U. S. O. night movies.
—A Signal Corps Photo

INTERNATIONAL PROJECTIONIST

VOLUME XIX JUNE 1944 NUMBER 6

Revising Inspection Routines to Meet Present-Day Conditions

By *HENRY B. SELLWOOD*

MOST theatres have some form of routine projection room inspection. It may amount to no more than a glance around at meters and so on by a projectionist who works in that theatre regularly and knows just what to look for when he starts work in the morning. It is sometimes a rather elaborate procedure, with the projection crew reporting an hour before show time and making a detailed check on all equipment.

Some theatres even have installed special switches whereby every low frequency and high frequency speaker unit can be tested individually every morning for volume, quality and rattle (if any), and have made other special provisions for elaborate daily tests.

Many theatres, of course, enjoy the benefit of routine check-up by a visiting service inspector—which in these times is more valuable than ever before. But the service inspector does not visit the theatre every day. He may not visit it every week.

Between his visits the projectionist logically is responsible for all necessary adjustments and maintenance, and above all for catching small troubles before they have a chance to grow into large ones. If the theatre does not take regular service at any time, the responsibility of the projectionist is that much greater.

At present, prompt shipment of replacement parts is not assured and cannot be counted upon; many sources of emergency help formerly open to the theatre do not exist; apparatus is wearing out with passage of time but cannot readily be replaced. And tubes and some other parts are not invariably of the same high quality as in other days.

For these reasons, among others, inspection routines still surviving unchanged from peace-time days can very advantageously be revised and made much more thorough. Where there is no routine, or at least no formal routine, it should prove very desirable to set one up.

Exhibitors would be well advised if they paid their projectionists to come in an hour before the show for purposes of pre-show inspection and adjustment. An occasional few hours after the show, say one or two nights a month, should also prove in most theatres a highly valuable form of insurance.

Spare Parts

Especially important at present is careful and repeated check of the spare parts inventory—and, still more important, revision of that inventory to suit wartime conditions.

Many theatres have a list of the spare parts they feel they should keep on hand; in others, one of the projectionists usually has a fair idea of how many of each type of spare ought to be in the projection room.

But such inventories, listed or kept in mind, often were based on a state of things in which new parts, when ordered, would be delivered with greater promptness than is possible today. Again, such inventories often were based on the local availability of parts, especially sound parts. When ordinary amplifier components, for instance, could be found in an emergency in the radio repair shop around the corner, the theatre could and often did neglect keeping up the projection room supply. Today, the radio shop may be closed because its proprietor is in the service; if it is still functioning its stock of parts is certainly much diminished; if it does have parts they are likely to be used ones taken from some discarded radio or "seconds" which the radio shop got because they couldn't pass inspection for the armed forces. This applies also to certain types of tubes.

Theatre supply dealers and servicing companies are safer sources of supply, but they are handicapped by slowness in getting their own orders filled, and by shortage of manpower.

Despite all this, it is *not* good for the industry if individual projection rooms hoard parts which they perhaps will not need while other theatres need them and can't get them.

The spare parts list, therefore, should be revised by each theatre according to the present state of its equipment, the type and speed of replacement service offered by supply dealers and servicing companies with which the theatre does business, and the availability—under current conditions—of local sources of emergency supplies.

Making a new parts list, however, is useless unless the stock of spares on hand is periodically checked, as a matter of routine. Otherwise, as the parts are put into use, perhaps by relief projectionists and without knowledge of the regular crew, the stock diminishes, and when replacements finally are ordered they may be ordered too late in view of today's normal delays. Routine periodical inventory of the supply on hand is the only security. Such inventory should be taken at least once a month, preferably twice a month, until times return to normal.

Daily Equipment Check-Up

There are many points of detail, lubrication, for instance, or cleanliness of lenses, that every projectionist looks into daily as a matter of course. None the less, many theatres, and especially theatres belonging to well-operated chains, provide the projection room with some sort of daily report form, listing in detail the various items to be checked each day.

Such forms are valuable in assuring that nothing is overlooked, and they are particularly useful as guides to relief projectionists who may not be fully familiar with a particular projection room or with all the details of some make or type apparatus.

Among the points likely to be included in such daily inspection forms are:

Sharpness, steadiness and brightness of picture. Existence of travel ghost. Overall quality and volume of sound. Lubrication—with detailed listing, for the benefit of relief projectionists, of every point in the apparatus which requires lubrication daily. Normality or abnormality in the reading of all installed meters.

Many theatres also have forms for daily report on all film—whether it is buckled, condition of sprocket holes, condition of patches, whether it is soiled, etc.

However, other points also should be checked daily. If there is a motor generator, the state of its brushes and commutator should be looked to. If a commutator is neglected until it has to be turned down on a lathe the theatre may encounter considerable delay in finding a machine shop with time to do it. If the commutator is looked after daily, it is improbable that there will ever be any necessity for such drastic treatment. Bearings should not be lubricated any oftener than the manufacturer has specified, but a daily check to make sure they are not overheating is decidedly in order.

Every part of the equipment, in fact, should be checked daily for signs of overheating. Serious overheating means trouble coming up. The sooner it is caught, the less chance there will be of damage to some part that may be very hard to replace.

When projectionists are authorized to report before show time for purposes of more detailed inspection other valuable tests can be made. In some theatres all film is observed on the re-winder before it ever is threaded into a projector. This eliminates any chance of a bind-up, with possible damage to the projector, because of some fault in the film and, of course, makes for a better show.

Additionally, each lamphouse is checked in the morning before it is used—when it is cold and can be examined and worked on more thoroughly than during the performance. In such cases the exciter lamp focus and lateral adjustment of film guides are looked to; sound tests may include running a few yards of test film, and they may also include check of non-synchronous sound sources, such as a record player. In some theatres the starting time of each projector motor, in seconds, is recorded in these morning inspections; and, as already mentioned, each screen speaker unit may be played individually to make sure that no rattle or distortion has developed, and that its volume and quality are normal. This is definitely important in the larger theatres where defects in one speaker unit may be audible only in certain seats—a fault which, if not checked for daily, has been known to go on unnoticed for weeks. But patrons in those seats were annoyed by it, even if they didn't know what was the matter.

Weekly Detailed Checkups

Where there is no switching provision for checking speaker units individually, a useful test can be made before the show by playing film or a record while someone walks around every part of the auditorium.

In theatres that use public address speakers for any form of stage entertainment those speakers — unless firmly mounted in position—should be checked daily. Sometimes p.a. speakers are mounted on stands or suspended in some fashion, and the porters disturb their positioning while cleaning the theatre.

To assure that all points that need daily check-up are checked daily, a form of some kind should be drawn up. Some theatres use printed forms. A typewritten form can be so drawn that it will serve for an entire week; and if several carbon copies are made the form need not be retyped oftener than once a month.

Every such form should have blank spaces in which special items can be added. If any part of the apparatus is giving way to the point where it does not as yet need replacing but should be watched daily, an appropriate entry can be made in the blank space from then on until the doubtful part is finally replaced.

Such precautions make certain that everything that needs daily watching will be watched irrespective of whether a regular crew or a relief crew are on duty.

There are some details, some points of lubrication, for example, that need checking only weekly instead of daily. Here again, whatever provisions were found adequate in more normal times may be less than adequate at present. They should be reviewed accordingly.

If there is a service inspector who visits the projection room every week, the weekly inspection can safely be left in his hands; but if his visits are more widely spaced, or if there is no servicing arrangement, then the weekly check-up becomes the job of the projectionist.

A weekly inspection form can be divided into seven parts (six parts if the theatre doesn't run Sundays) and one part looked to each day. This becomes a relatively simple matter if the projectionists are authorized to report an hour before show time, at least some days of the week. Those details of the weekly check-up that can't very well be looked into while the show is running can then readily be checked before show time.

Items that may be included in a weekly inspection routine are:

Condition of lamphouse wiring, of carbon jaws, of lamphouse feed motor brushes and commutators, lamphouse relay contacts. Fire shutter action, condition of sprocket teeth, condition of aperture plates and film guides. Take-up tension and action; sound stabilizer drum action; condition of drive gears. Also the cleanliness of all sound switching and volume control contacts; possible sagging of filaments of large tubes, and of exciter lamps. Blackening of exciter lamps. Points of lubrication which the manufacturers of different items of equipment have specified for weekly attention.

As in the case of the daily check-up, a regular form should be made for weekly inspections, and this form also should be provided with blank spaces in which special items can be added so that any part of the equipment that is showing signs of weakening can be given special attention until after it has been replaced. A specific tube, for example, may have reached that point of deterioration with age where it is still good enough to use, but ought to be meter-checked at least once a week.

Occasionally an arc supply rectifier of the copper oxide or copper sulphide type may have been installed somewhere outside the projection room. These devices run for long periods without needing much attention, but a weekly check for overheating will do them no harm and may do the theatre some good.

Monthly Check

Where a service inspector visits the projection room at intervals of between one week to one month the projectionist may safely leave all inspection, beyond that noted above, to his service man. The instructions given the inspector by his

company will take care of any modifications in his procedure which changing wartime conditions may require.

If the theatre does not receive regular service inspection the projectionist must do this work—there is no one else to do it.

Included in a monthly inspection, as a rule, are:

Tests of all tubes. Matching of both projectors as to volume and quality by means of test film and a volume meter. Check of the amplifier for volume and quality by the same means; while the record player, if one exists, can be similarly checked by means of a test record. Depending on the type of motor driving the record player, a stroboscope check of turntable speed also may be desirable.

Tube sockets and prongs should be examined for cleanliness, and some types of socket contacts (and the tube prongs that contact them) should be checked for signs of arcing or pitting.

Volume controls, exciter lamp rheostats if any, sound switches, should be examined for signs of wear or improper switch action, or scoring of contact points. Every readily accessible gear of projeetor and soundhead should be looked to for indications of excessive wear. If the theatre is equipped with a light meter, a monthly check may be made (out of show hours, of course) of the reflectivity of the screen—that is, the extent to which it has become soiled.

Unless the theatre has a complete duplicate amplifying system, the tube tests referred to above, and some of the other tests, will have to be made out of show hours. The overtime payments necessary for such work are insurance—never more necessary than today.

At intervals of between one month to one year, all apparatus should be given a very complete overhauling. This includes blowing dust out of all apparatus (use a bellows or a reversed vacuum cleaner), inspecting all soldered connections and touching up any that look at all dubious, checking all bolts for tightness (loose bolts in an amplifier's power transformer make sound noisy, and they do work loose with time), check of all backscreen sound contacts, check of sound distribution throughout the auditorium (a speaker may have shifted position), thorough light check of screen reflectivity, and in general, a very thorough inspection of just about everything. Also, a kind of spring housecleaning of all apparatus. Depending on the number of hours a day the theatre operates, and other factors, it may be desirable to send the projectors out for overhauling once a year or oftener.

If the theatre has servicing arrangements of any kind, even if these do not include regular inspection visits, a service inspector should be asked in for such thorough check-ups. If there is no servicing arrangement at all, the local supply dealer can perhaps send a technician to take part in this work.

Making Inspection Forms

A really thorough inspection of this type is often an all-night job, though, of course, it can be broken down into several hours for each of several successive nights.

It is as much a common-sense necessity as a periodic visit to a doctor or a dentist—just to make sure, and to catch obscure symptoms before they grow out of the obscure class. It is also, as said, a kind of spring housecleaning, which is more important than may at first be apparent. Dust and dirt will accumulate inside all apparatus that the air can reach; and air must be admitted to nearly all theatre apparatus for ventilating purposes. Now as the dust accumulates inside a rectifier or what-not it acts as a heat insulator, with the result that the parts covered by dust run hotter than they did originally or were intended to. If that condition is neglected year after year, while the dust grows thicker and thicker, something is going to give way.

To repeat—apparatus and parts are now hard to get. Orders for them, if filled, may be filled only after long delay. All sorts of local sources of emergency help—B batteries, for example, or automobile storage batteries in case a filament transformer goes wrong—are, practically speaking, out for the duration. Servicing companies and supply dealers have their own equipment problems and manpower problems. Inspections, designed to keep equipment in good condition, and to catch troubles while they are still in the unimportant stage, were never half as necessary as now.

It is not at all hard to make up inspection forms for a given projection room. To make them up for a chain of theatres, or for theatres in general, is much more difficult because conditions vary so greatly. But any competent projectionist knows roughly what items in his care need lubrication daily, weekly or monthly; which parts need to be watched daily and which can safely be inspected only once a month, etc. The suggestions given above, which are based on common practice, should help.

With those suggestions as a guide, the projectionist need only go about his own domain, stopping at each piece of apparatus to list what things about it should be checked daily, or weekly, or monthly, or annually. He makes up four lists accordingly, and passes on to the next piece of apparatus, until he has checked every one — including his spare parts cabinet!

Those lists are his inspection forms. He can re-arrange them into any kind of chart he likes, or use them as simple lists. It doesn't make much difference. The important thing is to have a typed or printed or written reminder—in detail—which assures that nothing will be overlooked, and which will guide relief projectionists who may not be completely familiar with all the apparatus and all the projection room conditions.

SMPE TO CONVENE OCT. 16-18 IN NEW YORK

The 56th semi-annual fall conference of the Society of Motion Picture Engineers will be held at the Hotel Pennsylvania, New York City, Oct. 16 to 18, W. C. Kunzmann, convention vice president, announced. He also said that newly elected officers for 1945, together with recipients of the Progress Medal Award and the Journal Award Certificates for 1944, will be announced during the conference.

Although social affairs held in conjunction with the conference were absent from the spring meeting program, the possibility of a luncheon and dinner-dance during the fall conference will be considered at a meeting of the society's board of governors in New York in July.

Maintenance of Generator Brushes

By *M. P. DEMING*
RCA SERVICE COMPANY, INC.

Sparking of commutator brushes may be due to one of the following causes:

1. Machine may be overloaded.
2. Brushes may not be at commutation point. Try moving in a position where there is no sparking.
3. Brushes may not be fitted in the holders or may be wedged in tight.
4. Brushes must be fitted to circumference of commutator.
5. Proper pressure must be taken into consideration.
6. Look for burnt brushes.
7. Look for rough commutator.
8. Commutator bar may be loose or projecting above others.
9. Look for dirty, oily or worn-out commutator.
10. Check proper carbon in brushes.
11. Check spacing of brushes around periphery of the commutator.
12. Equal pressure should be maintained on all brushes so that they will take an equal amount of current.
13. High mica will cause vibration of the brushes. A pressure of about $1\frac{1}{2}$ lbs. per square inch is the proper brush tension. The carbon brush should overlap about two segments.

Step-by-Step Analysis of Arc Rectifier Schematics

By *LEROY CHADBOURNE*

IN FIGURE 1 we have a schematic of a single-phase arc rectifier. A glance at the lower right-hand corner shows that this device utilizes a pair of diodes as the rectifying medium. These tubes usually will be connected in a conventional full-wave circuit.

The a.c. input is seen in the upper right-hand corner. It connects to the top row of coils, and these coils, therefore, should be the primary of the power transformer. The switching arrangements associated with them require a little more detailed study.

Switch terminals associated with the left-hand coils in the upper row are marked 110, 220. This rectifier, then, may be made to be used either with two-wire, single phase, 110 volt a.c., or with two-wire, single phase, 220 volt a.c.

Those switches are set at 220 in the drawing. The input power can be traced from the top wire at the upper right left, down, and in at terminal *O* of the left-hand upper coil. Thence through that coil, through the switch blade, and down, right and up to terminal 2 of the middle coil of the upper row. Through this coil into the right-hand coil; thence down, through one of the tap terminals and the tap switch, right, up and right to the other side of the power source. It is apparent that all three primary coils operate in series when the switches are set for 220-volt input.

Assuming the switches, or links, to be set at the 110-volt position, and tracing left along the upper input wire as before, it will be seen that two parallel paths are provided for the current. Trace through the left-hand coil as before, then down, right to the 110-volt switch terminal, through the switch blade and up and through the right-hand coil. This time the middle coil is not in series with the other two. Now going back and tracing again, follow down past terminal *O* of the left-hand coil to the 100-volt switch terminal, through the switch blade, right and up through terminal 2 to the center coil, thence through the right-hand coil as previously.

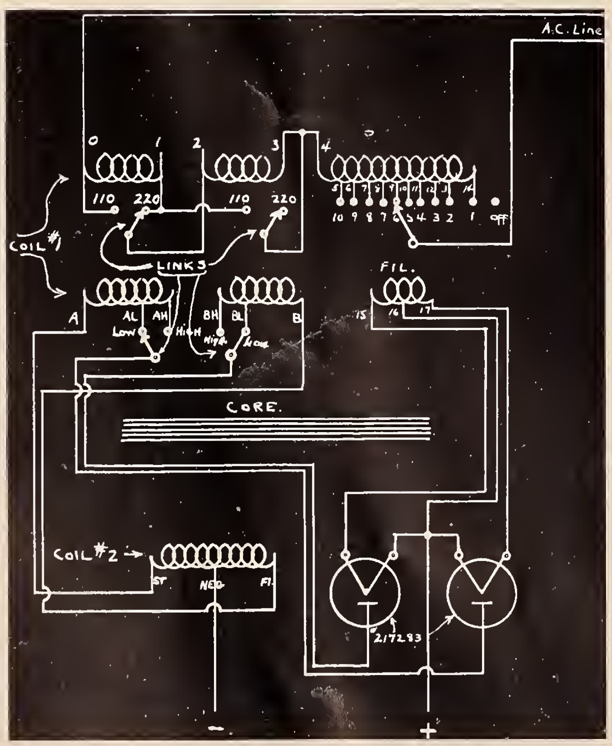
It is evident that when the switches are set for 110 volt input, the left-hand coil and the center coil are in parallel to each other. Through the switches, terminal *O* is connected directly with terminal 2; terminal 1 is joined to terminal 3. But though these coils are thus connected in parallel with *each other*, the two of them together remain in series with the right-hand coil, in that their combined current must flow through the right-hand coil to complete its circuit.

The tap switch of the right-hand coil can be adjusted independently to compensate for line voltage variations, regardless of whether the input used is 110 volts or 220. This switch can also be used as the on-off switch; when it is moved to "off" at the extreme right, the a.c. line is opened.

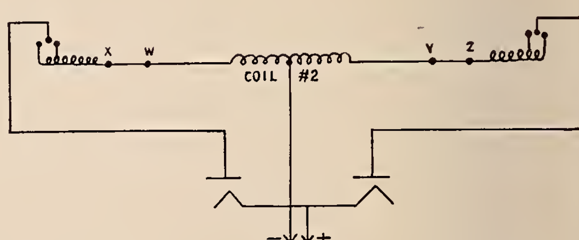
The above exhausts every detail of the primary circuit as drawn. There are no other solid connections to it, and all other current flowing in this device must therefore be derived directly or indirectly from the voltages generated by induction in the transformer's secondary windings.

Drawn just beneath the coils previously considered is a row of windings which must be secondaries. The one at the right is marked "Fil.", and a glance at its connections shows that it supplies the filaments of the rectifier tubes—those filaments being wired in series with each other.

However, no direct information is given in the diagram as to how this filament voltage is kept the same regardless of

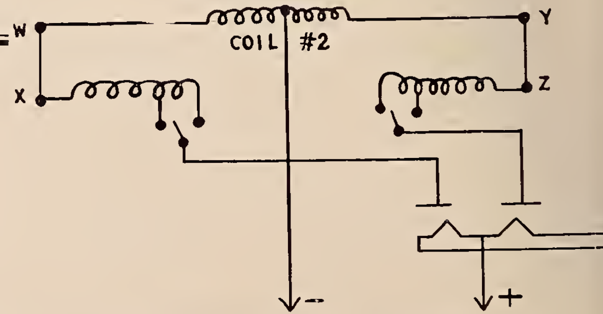


(*Left*) FIGURE 1



(*Above*) FIGURE 1-A

(*Below*) FIGURE 1-B



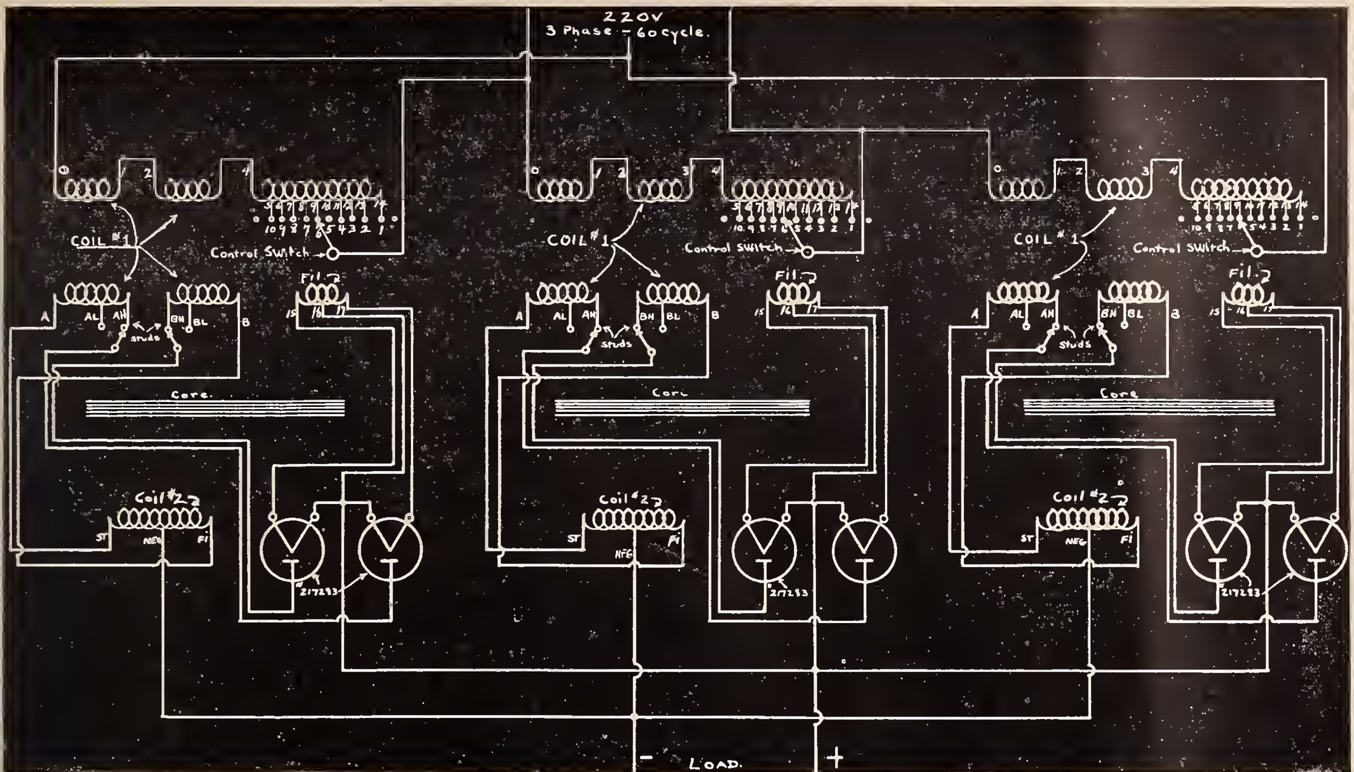


FIGURE 2

whether the primary voltage happens to be 110 or 220. There must be some provision for that. Since there are no switches of any kind in this filament circuit. the provision must be included in the transformer. The transformer should be wound in such way, or the coils so shielded. that the voltage induced in the filament winding will be the same with either power supply.

The two coils drawn just left of the filament winding must be for the purpose of supplying the plates of the rectifier tubes. and this is easily checked. Trace from the plates of the tubes down, left, up. left, up and right, and it will be seen that the plates connect to those secondary coils through the link switches.

Re-Sketching Schematics

Different draftsmen represent the same facts in different ways; different manufacturers have their own styles. Figure 1 is an excellent illustration of the fact that sometimes the easiest way to understand a schematic is to take a pencil and scrap of paper and sketch it a little differently. Such a sketch will of course include only the particular circuit under consideration, *not* the whole schematic.

Many readers may find the plate circuit of Figure 1 easier to understand if they re-draw it, leaving out such details as the core of the transformer and the primary windings. That has been done for the reader in Figures 1A and 1B.

Let us refer to Figure 1A. Coil No. 2, lower left corner of Figure 1, has been shifted to top center in Figure 1A. No other change has been made; the connections are absolutely identical.

Now look at those places in Figure 1A to which the designations *W*, *X*, *Y* and *Z* have been added. Assume those points are like the joints of a carpenter's rule, and we're going to unfold the rule—stretch it right out into a straight line. That has been done in Figure 1B. And many readers will recognize in Figure 1B, at a single glance, a perfectly conventional full-wave rectifier circuit with which they are thoroughly familiar. Figures 1A and 1B tell exactly the same story as the plate circuits of Figure 1. All three will now be traced in detail to prove this.

In Figure 1, assume the tap-switch end of the left-hand secondary coil to be momentarily positive. Trace its circuit from positive to negative: from the switch blade to the plate of one tube (the right-hand tube in this case), to tube filament; to the filament jumper and out at the positive d.c. terminal. Through the external load to the negative terminal, to the center tap of coil No. 2, and left through that coil to the left-hand secondary winding.

In Figure 1A, also assume the tap-switch end of the left-hand secondary coil to be momentarily positive: trace to tube plate, to tube filament, out through the load, in at the negative terminal, through the center tap of coil No. 2, and left through that coil to the left-hand secondary winding.

In Figure 1B—remember the coil has been swung around like a segment of a carpenter's rule, and the tap-switch end is now toward the left—trace exactly as before to plate, to filament, to external load, in at negative terminal, to center tap of coil No. 2 and so on.

The right-hand halves of Figures 1A and 1B can be compared similarly with the circuit of the right-hand plate secondary coil of Figure 1.

As the plate secondary coils are drawn in Figure 1, the voltages induced in them will be in the same direction. Therefore, when the tap-switch end of one coil is (momentarily) the positive end of that coil, in the other coil the tap-switch end will be momentarily negative. Hence the plates of the two tubes will be 180° out of phase. These rectifier tubes are connected in a full-wave circuit, not in parallel.

In Figure 1A the coils are drawn exactly the same way (except that coil No. 2 has been transferred to a different location). And in Figure 1B the tap-switch ends are shown at opposite extremes of a secondary winding, and of course are at opposite polarities.

Here then are identical electrical facts, schematically represented in three different ways, all three accurate. The purpose of a schematic is to make electrical facts as clear as possible—clear at a glance if that can be done. But different draftsmen and different companies have their own ideas of what arrangement represents the greatest possible clarity and their own styles. The projectionist puzzled by a schematic will therefore often find it helpful, and sometimes almost indispensable, to make a quick sketch, translating the same facts into a form with which

he happens to be more familiar.

The switches of the secondary coils of Figure 1 have not yet been examined. They are links which can be set to give two choices of secondary voltage, independently of whether 110 volts or 220 volts is flowing in the primary.

Circuits of Figure 2

Figure 2 represents a three-phase arc supply rectifier. The a.c. input is at the top, center; the d.c. output at the bottom, center. The uppermost row of coils, being connected directly to the a.c. supply, must be the power transformer primaries.

Here again the projectionist may wish to clarify a circuit—this primary circuit—by re-sketching it in a somewhat different way. To do that as simply and quickly as possible, details can and should be omitted. There is a total of nine primary coils, assembled in groups of three. Consider each group for the time being as one coil, and neglect the tap switches, and this primary can be re-drawn as in Figure 2A. In other words, the primary is delta-connected; if that fact isn't obvious as it is drawn in Figure 2, re-sketching as in Figure 2A makes it so.

Let the bottom coil of Figure 2A represent the middle coil in the primary line-up of Figure 2. Note that this coil in both figures connects to the two outer wires of the a.c. supply. Let the left-hand sloping coil of Figure 2A represent the left-hand primary assembly of Figure 2, and the right-hand sloping coil of Figure 2A the right-hand primary of Figure 2. Note that one end of each of these coils connects to the central coil, while their other ends are joined together and also joined to the middle input wire.

All that was done in sketching Figure 2A was to treat the primary coils of Figure 2 as if they represented a stretched-out carpenter's rule of three sections. The two outer coils were then folded up toward the center coil until the "rule" took the shape of a triangle, with the tips of the two outer segments touching each other, and both also touching the middle input wire.

Each of these primaries, taken separately, should also be compared with the primary arrangements of Figure 1. A strong resemblance will be apparent at once. The sole difference is that the 110-220 volt switches of Figure 1 are omitted in Figure 2, inasmuch as Figure 2 is to be used with 220-volt, 3 phase input *only*, and can't be used with any other type of supply. The secondary link switches, however, which give choice of two secondary voltages, appear in Figure 2 as well as in Figure 1.

And now, whether he knows it or not, the reader has completed a step-by-step examination of Figure 2. There is no need to trace all the secondary circuits, because they are simply the secondary circuits of Figure 1 repeated three times over. The only exception is that there are three d.c. outputs instead of one. These three d.c. lines are brought together, in parallel (along the bottom of Figure 2), to form a common d.c. souree supplying 60-90 amperes to the arcs.

These three secondary circuits of Figure 2 could, of course, be re-sketched as Figures 1A or 1B, three times repeated.

Figure 2, then, employs 3 phase arrangements only as far as the primary windings of its power transformer. Beginning with the secondary windings the device consists essentially of three separate and independent rectifiers, with their d.c. outputs wired in parallel.

Circuits of Figure 3

In tracing through Figure 3 it will be convenient to check first through the auxiliary circuits along the right side of

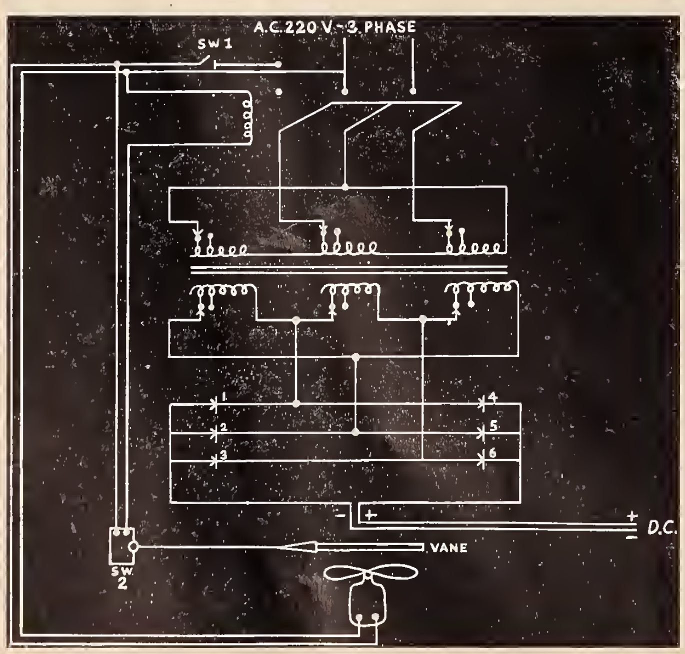


FIGURE 3

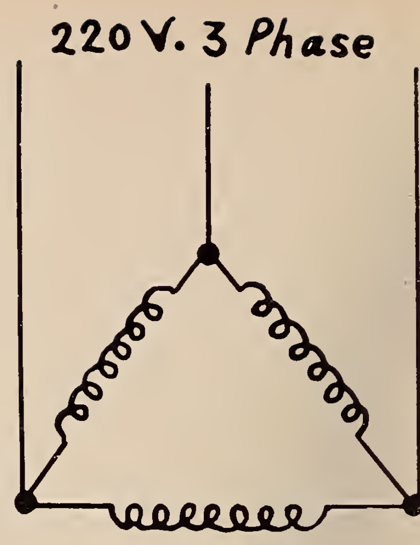


FIGURE 2-A

the diagram, so they will not introduce any confusion in considering the main parts of this rectifier.

At the top of the diagram single-phase 110 volt a.c. is tapped from the main power line. The switch SW 1 is closed to energize the fan motor shown at the bottom, center, of the drawing. This fan (the principal purpose of which is to keep the rectifier stacks from overheating) blows against the hinged vane shown just above it. When the vane is lifted by the current of air, it closes switch SW 2, at the bottom, left, of the diagram. The closing of these two single-phase switches permits current to flow through the vertical coil drawn just to the left of the triple blade, three-phase a.c. switch. That coil is a magnet coil operating the three-phase switch; if the coil current is interrupted, the three-phase switch opens automatically.

If the fan slows down or stops for any reason, the vane just above it drops back, switch SW 2 opens, current is removed from the magnet coil, and the main power switch opens. In other words, these circuits along the left side of the drawing constitute a cooling circuit and a safety device—they are auxiliaries to the main rectifier circuit, but not part of it.

Switch SW 1, which sets this rectifier into action or closes it down, may be located at or near the lamphouse, so the rectifier can be controlled from that position.

Tracing Rectifier Circuits

Now that these auxiliaries have been checked briefly, the rectifying circuits themselves can be traced more easily.

Three-phase power enters this unit at the top of the drawing, through the magnetically-controlled three-blade switch. Note that the power transformer's primary wiring is completely identical with

(*Continued on page* 25)

37th I. A. Convention

ALL incumbent officers of the International Alliance of Theatrical Stage Employees and Moving Picture Machine Operators of the United States and Canada were re-elected at the 37th Convention held in St. Louis, Missouri, the week beginning May 29. Nine hundred and seventy-three delegates, representing seven hundred and twenty-eight local unions, were in attendance—the largest number ever assembled at an I. A. Convention.

St. Louis Locals Nos. 6 and 143, in charge of Convention arrangements, did a bang-up job and unstinted praise was heard on all sides for the splendid and efficient manner in which all matters were handled. We might say, in passing, that this was one of the smoothest running conclaves of I. A. representatives ever gathered under one roof.

Resolutions recommending a fourth term for President Roosevelt were unanimously passed by the Convention. Several constitutional changes were made, the most important one being the addition of two vice-presidents (one of whom must be a studio worker) to the I. A. executive board. The newly elected vice-presidents, Louise Wright, Local No. B-53, Dallas, Texas, and William C. Barrett, Local No. 80, Hollywood, Calif., increase the number of I. A. vice-presidents from seven to nine.

According to the report of the Board of Trustees, cash on hand amounts to $262,102.01, plus securities, the cost value of which amount to $137,018.26. Other assets amounting to $51,461.44 were reported, and the sum of $153,107.02 in the Transportation and Per Diem Fund for the 1944 Convention makes a grand total of $603,688.73. This latter figure exceeds by $50,000 the largest sum ever reported in the I. A. treasury.

Many Recommendations

Among the more important features of the President's report were recommendations endorsing the principles of vacations with pay in all contract negotiations; that stage hand locals effect a return to the maintenance work in theatres previously performed by them; the recognition of the jurisdictional rights of I. A. members with respect to television, and the elimination of the permit system in Local No. 110 of Chicago and Local 143 of St. Louis. The amalgamation of Local No. 306 and the Empire State Union, New York City, was also discussed in the report. President Walsh reported an increase of $21 a week in the road scale, the largest increase ever obtained for traveling I. A. members in the history of the Alliance. He recommended in his report that Article One, Section Two of the International Constitution be amended by inserting the word "Television" after the word "Theatrical" in the third line of this section, thereby making it read:

To achieve, by organization and mutual endeavor, the improvement of the social and economic conditions of workers identified with the theatrical, television and moving picture industries of the United States and Canada.

The foregoing recommendation was referred to the Resolutions Committee who returned with a recommendation of concurrence which was passed by the Convention.

William Green, president of the A. F. of L., addressed the Convention. He made several noteworthy points, stressing in particular the important role organized labor is playing in the war effort. "The services rendered by the members of your Union in the theatrical and motion picture industry," said Mr. Green, "have been of great educational benefit to the great masses of our people. Through these agencies of public information the war has been brought much closer to the people and the issues have been more clearly defined.

"I trust," continued Mr. Green, "that it is not too much to expect that this industry will also exert a great moral force in the post-war period by exposing the horrors of modern warfare and by mobilizing public opinion in favor of international action that will outlaw wars for all time to come."

Pres. Richard F. Walsh

Other speakers were Leslie Spilker, assistant city counselor, who represented the mayor of St. Louis; Joseph P. Clark, president of the St. Louis Central Trades and Labor Union; Rabbi Samuel Thurmann; R. T. Wood, president of the Missouri State Federation of Labor; Rev. Francis A. Growney, and Elmer Dowell, of the War Finance Division of the U. S. Treasury Department.

Convention Election Results

International President	
Richard S. Walsh	577
William Bennett	416
1st Vice-President	
Harland Holmden	538
Walter Croft	356
Russell L. McKnight	90
2nd Vice-President	
William P. Covert	616
Harry Pearson	369
3rd Vice-President	
Floyd M. Billingsley	883
4th Vice-President	
James J. Brennan	617
Robert Brannigan	288
Ben Scher	76
5th Vice-President	
Roger M. Kennedy	652
Jeremiah F. Galvin	315
6th Vice-President	
Felix D. Snow	661
Arthur W. Lyday	316
7th Vice-President	
Carl G. Cooper	539
Harold V. Smith	434
8th Vice-President	
William C. Barrett	483
Arthur T. Dennison	313
C. W. (Pat) Offer	134
Arthur J. Moran	45
9th Vice-President	
Louise Wright	346
W. T. (Lou) Clendenning	305
Herbert Aller	248
John R. Martin	78
Secretary-Treasurer	
Louis Krouse	580
John A. Shuff	394
Trustees	
George W. Brayfield	756
R. E. Morris	625
William C. Scanlan	616
Bert Bell	355
Sam Isaacson	244
Magnus Nielsen	122
Del. to A. F. of L.	
Thomas V. Green	758
E. J. Brock	601
Leo Barber	378
Del. to Dom. Trades	
James H. (Hank) Leslie	776

IN THE SPOTLIGHT

By *HARRY SHERMAN*

THIS month we shall devote our columns to a report on highlights and personalities at the 37th I. A. Convention as seen through the eyes of your reporter. We look forward to these bi-ennial gatherings and it warms the cockles of our aging heart to get together with the old-timers and gab about the "good old days." We also enjoy meeting the newcomers in our organization. Limited space prohibits the mentioning of all with whom we confabbed at the convention, and many notes we jotted down in our little black book will have to forego the smell of printers' ink.

The Gold Room of the Jefferson Hotel in St. Louis was decorated with the flags of the United Nations, with the flags of the United States and Canada prominently displayed. On the opening day of the convention a local band played popular selections, and Ralph Mulcahy, member of Local No. 143, St. Louis, Mo., sang several selections—"The Star Spangled Banner," "O'Canada," and "Dixie." Mulcahy's renditions were roundly applauded and the delegates present showed their appreciation of his fine voice by their rousing cheers.

The convention was brought to order by LeRoy Upton, president of St. Louis Local No. 6, and the Rev. Leo S. Brown, S. J., pronounced the invocation. Harvard O'Laughlin, president of St. Louis Local No. 143, made the welcoming address and introduced the speakers of the day. The first speaker was Assistant City Counsellor, Leslie Spilker, who pinch-hitted for the mayor. He was followed by Joseph P. Clark, president of the St. Louis Central Trades and Labor Union, who spoke on the importance of labor in the post-war period. Rabbi Samuel Thurmann, the next speaker, received a tremendous ovation at the conclusion of his address. R. T. Wood, president of the Missouri State Federation of Labor, who then followed, spoke eloquently on the early history of the Alliance in St. Louis. Rev. I. T. Gragg pronounced the benediction, after which I. A. President Walsh officially opened the convention.

The usual committees were appointed, and the report of the Credentials Committee was then read by Louis Krouse, I. A. secretary-treasurer, who turned the final reading of the report over to the reading clerk, Paul E. Smith, member of Local No. 342, Butler, Penna. The session was then adjourned to the following day.

The second day's session of the convention opened with a Memorial Day service in memory of our departed brothers in this and in World War I. United States Army Chaplain Capt. Jesse L. Henderson gave prayer and concluded the ceremony by placing a wreath at the foot of the symbolic grave on the rostrum, while a member of the army corps sounded taps. It was a touching and impressive scene that long will live in the hearts of those who witnessed it.

The address of William Green, president of the A. F. of L., to the delegates on the third day of the convention was enthusiastically received. The speaker of the day, however, was Rev. Francis A. Growney, a guest of Danny Gill, business agent of Local No. 10, Buffalo, N. Y. Rev. Growney was accorded an ovation at the conclusion of his talk and had to give an encore before the delegates would permit him to leave the speakers' stand.

The task of reading the resolutions offered has been Fred Newcomb's, Local No. 223, Providence, R. I., for the past ten or twelve years. Despite the sweltering heat, Fred stuck to his job to the very end.

Elsewhere in this issue will be found a report on some of the business covered at the convention.

● John Francavilla, president of New York Local No. 702, lost his shirt playing pinochle on the train going to St. Louis. He was taken over by his own delegation.

● Thad Barrows, president of Local No. 182, Boston, Mass., sat on the players' bench during the ball game between the St. Louis Browns and the Boston Red Sox. Thad, a personal friend of the Red Sox players and their most loyal fan, autographed a new bat for Manager Cronin, who hit in the winning run of the game. Thad was a proud guy after that—he felt that the winning of the game was a personal tribute to him.

● We almost had a drink with Arthur Smet, business agent of Local No. 195, Manchester, N. Y. We say almost because Arthur is the kind of a guy who will offer you a bottle and ask you to take a drink and then proceed to do all the drinking himself. To his traveling partner he is a "Canadian Club Indian giver." You figure that one out.

● There wasn't a finer looking pair of delegates at the convention than Charles Ring and John E. Krebs, president and business agent, respectively, of Local No. 327, Cincinnati, Ohio. They are both clean-cut chaps and they made many new friends for themselves and for their local.

● James L. Perry, president of Local No. 142, Mobile, Ala., since 1914, informed us that he has been a member of the I. A. since 1908. Although he admits being 62 years old, Perry is more active than many a man half his age.

● A highlight of the convention was the "ten-gallon" hat sported by Herman Gelber, president of New York City Local No. 306. A Times Square version of what the well dressed cowboy should wear.

● We spent a very pleasant evening with four Canadian delegates and we learned plenty about the virtues of their respective locals and the Dominion of Canada and the thrill of hunting caribou. Our hosts of the evening were Edward Nally, Local No. 129, Hamilton, Ont.; Fred Hoodless, Local No. 357, Kitchener, Ont.; George Sim, Local No. 467, Ft. William, Ont., and Edward England, Local No. 461, St. Catherines, Ont.

● The National Theatre Supply Company was well represented by Bill Earle, manager of the St. Louis branch; Philadelphia branch manager, Harry Blum-

berg. and Lou Walters, of Cleveland, recently appointed head of the newly formed Drive-In-Theatre Equipment Division. Earle, and his able assistants, Blumberg and Walters, played host to the visiting delegates and their hospitality was the talk of the convention.

● Another popular spot was the headquarters of the delegation from Local No. 110, Chicago. James Gorman, president of the local, was always on hand to greet the visitors as were Gene Atkinson, an old hand at convention gatherings, and delegates Clarence Jalas, Larry Strong, Frank Galluzzo, Charles McNeill, Joe Rossberger and Arthur Tuchman. These men were swell hosts and they made many new friends for Local No. 110.

● While at the convention Frank Olsen, business agent of Local No. 2, Chicago, Ill., was notified that his son was killed in action somewhere on the European battlefront. Upon hearing the sad news, Frank immediately left for home, taking with him the sympathy of every delegate.

● Louise Wright, Local B-53, Dallas Film Exchange Employees, and the newly elected ninth vice-president, is the first woman to become a member of the I. A. executive board. Her campaign was managed by another femme, Rosaline Hutton of the Charlotte, N. C., Film Exchange Employees. Yes, sir, the gals seem to be going places.

● One seldom saw I. A. first vice-president Harland Holmden around the lobby of the Jefferson Hotel (convention headquarters) without running into Victor Welman and Charlie Bullock, all members of Cleveland Local No. 160. The deep and loyal friendship that exists between these men is inspiring to all who know them. George Simko, the fourth member of this intimate group did not attend the convention.

● Harvey Hill, business agent of Local No. 249, Dallas, Texas, was accompanied by Mrs. Hill. Harvey was strictly on the wagon and very much on his most dignified behavior. He had a couple of good stories on tap, however, that were pips. "Pappy" Luther was his bodyguard.

● The nomination of Jimmy Brennan, popular I. A. fourth vice-president, was seconded by Ada Nelligan, business agent of the Theatrical Wardrobe Attendants Local No. 764, the first woman delegate to second a nomination for an I. A. executive office.

● Altec Service Corporation was represented at the convention by their Chicago district manager, Bob Hilton; Tom Canavan, manager of their St. Louis office, and their California representative, Elmer Wilschke. S. P. McGuigan, a delegate representing Local No. 353, Port Jervis, N. Y., and A. H. Hosier, a delegate from Local 562, Hannibal, Mo., also represented Altec.

● It was like old times getting together with Johnny Dennis, business agent of San Antonio Local No. 407 and William Burr Keeler, member of the local. Bill Tinney, also a member of 407 and Manual Ayala, business agent of Local No. 678, Laredo, made up the rest of the male contingent of this party. Mrs. Dennis and Mrs. Keeler accompanied their respective husbands.

● We have been advised by the 10th District delegates that Bill Colquhoun of Local No. 121, Niagara Falls, N. Y., could easily win the prize as the world's worst and loudest singer. We were not able to judge Bill's musical abilities first-hand and we are not qualified at the present time to agree or disagree with the unanimous opinion of the 10th District delegates.

● Fred Shoup, business agent of Local No. 193, Bloomington, Ill., informed us that he recently hit the jack-pot. Fred, who is 52, gleefully announced that he became the daddy of twins—Terry Lee and Larry Gee.

● We were shocked when we learned of the accident that befell our good old friend, R. E. (Rut) Morris, the popular I. A. trustee from Mobile, Ala. He was hit by a trolley car in St. Louis, and we understand that if it were not for the quick-thinking of Eddie Miller, business agent of Local No. 279, Houston, and I. A. representative, who quickly pulled him out of the path of the moving car, he undoubtedly would have been run over and perhaps fatally injured. Morris was rushed to the hospital and it was found there that his arm was broken at the elbow and that he suffered two crushed ribs. Hourly bulletins were posted at the convention and according to last reports, he was expected to leave the hospital shortly and head for home. Incidentally, the car that hit Rut was the last one to run prior to the calling of the St. Louis car strike.

● Local No. 324, Albany, N. Y., was represented at the convention by business agent Eddie Wendt, as wide-awake and alert a local officer as it has been our good fortune to meet. Eddie told us that every one of the local's 47 members is a first-class projectionist and sound engineer. These men are constantly on their toes and are forever striving to keep abreast with developments in the craft. When television hits the theatres, Local 324 members will not be caught napping —every one of them will be a television expert.

● William H. (Lou) Clendenning and Herbert Aller, defeated candidates for the ninth vice-presidency of the I. A., graciously congratulated the successful candidate, Louise Wright. Aller got a big laugh when he said he might have trouble explaining to his wife his defeat by a woman.

● The 25-30 Club gained a number of new out-of-town members. Among those delegates who filed their applications for membership are Earl J. McCannell, Fargo, N. D.; Moorman H. Snow, Galveston, Tex.; Edward Bostelman, St. Louis, Mo.; George W. Schardt, Charleston, S. C.; Harvard O'Laughlin, St. Louis, Mo.; Pierce W. Webster, Buffalo, N. Y.; Emile L. Beaud, New Orleans, La.; Guy "Pappy" Luther, Dallas, Tex.; Walter S. Croft, Kansas City, Mo.; Wm. B. Keeler and John Dennis, San Antonio, Tex.; J. Max Ealy, Wichita Falls, Tex.; Wm. Bordonaro, Tarentum, Penna.; Charles Brunner, Altoona, Penna.; Orin

(Continued on page 27)

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

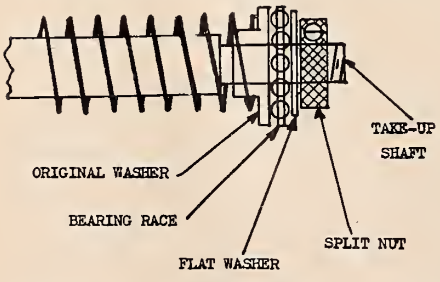
Checking Oil Seepage in 700 Apparatus Units on Universal Bases

The construction of the 700-Apparatus Units on Universal Bases would make it seem almost impossible for oil to seep in, yet in the majority of units, we find the cables oil soaked. This trouble usually is caused by oil dripping from the edge of the photo electric cell compartment. Surprising as it may seem, most Universal base jobs are so aligned that a drop of oil from the PEC compartment will split, half going into the oil pan, and the other half to the film amplifier compartment. (Try it some time by squirting a little oil on the PEC compartment and watch its behavior.)

This condition may be eliminated by fastening a suitable chute on the PEC door so that the oil will be directed to the oil pan. This chute may be made from a flat piece of tin about ½″ wide and 3″ long. A hole is punched in one end and placed beneath the screw that holds the knob on the PEC door.—W. V. Howard, *ALTEC.*

Upper Magazine Pay-Out Control

The chatter of the spring on the take-up magazine spindle can be stopped by shortening the spring a few turns and installing a roller bearing race between the washer and the lock-nut. This bear-



ing is the type used on ordinary bicycles. This idea has been put into effect and is working very smoothly and at very little cost (see diagram).—C. S. Schwander, *RCA.*

Emergency Bulb Extractor

Recently when operating a W. E. set one of the pilot lights burned out in the 713 control cabinet. Not having the special bulb extractor handy and being unable to get a loop of cord around the slippery bulb with enough grip to pull it out, I looked around and saw a bit of heavy gummed paper on a trailer can. A piece of this gummed paper was moistened and pressed to the side of the bulb for a few seconds and permitted to dry. The bulb was then removed without any further difficulty. Scotch tape might have been better for the job but I didn't happen to have any at that time.—M. Rushworth, *RCA.*

Ideal Commutator Dresser

Made by the Ideal Commutator Dress Co., Sycamore, Ill., is a pencil type, finish grade, standard size commutator resurfacer. This tool is a non-conductor and can be used on most of our commutators with the brushes in or out (preferably out) with excellent results. In many cases, where the commutator is not cut too much, it is possible to get a smoother finish than can be obtained with a lathe tool. Chattering is sometimes caused by the long motor shafts with spring, and then again in cases where the length of the shaft does not cause chattering, the condition of the bed plates on most lathes will produce it.

A larger and wider tool with a handle for arc generator commutators is also made by this company. The use of this utensil makes it unnecessary to remove these machines from the projection room for resurfacing.—M. F. Harrod, *ALTEC.*

Correct Use of Balancing Loops

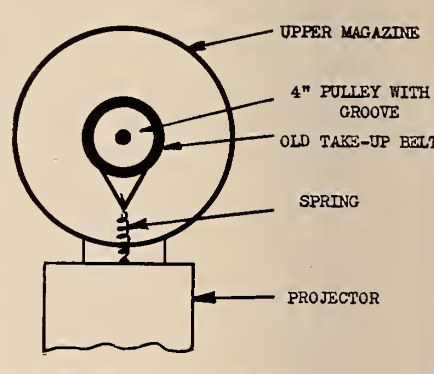
By inserting a new length of 300 cycle film into an old loop, I have discovered that a full one db drop-off will occur after thirty days of normal use in the field. It would seem advisable, therefore, when discarding a loop to check for level between the remaining old loop and the new one before placing them into field use.—F. M. Walls, *RCA.*

Rejuvenating Pad Rollers

Sharp edges of pad rollers can be removed by using an old pad roller shaft, two lock washers, an electric drill, a small fine grain file and some crocus cloth. Place one lock washer on the old pad roller shaft, then set the pad roller on shaft. Place the other lock washer on the shaft. The pad roller is now between the lock washers on the shaft. Put the remaining end of the shaft in chuck of electric drill. Tighten the chuck slightly, tap opposite end of pad roller shaft so as to get a snug fit of lock washers against the pad roller ends. Again tighten chuck. Use the small file to remove the sharp edges on the pad roller, and then polish with the crocus cloth. The pad roller will look as good as new. —G. E. Geiger, *RCA.*

Improving the Magazine Pay-Out Control

Another idea for the top magazine that works very well is to install a small pulley on the upper magazine shaft, as shown in the sketch below, with the



spring, etc., removed. A take-up belt around the pulley and a spring to hold a tension make this a perfect magazine pay-out control that works without a jerk. —C. S. Schwander, *RCA.*

Checking Stabilizer Bearings

The following procedure is a good check on stabilizer bearings: Thread in a 9,000 cycle frequency loop. Set booth monitor control to full on position. With amplifier volume control in normal position, start the projector, and check acceleration time for good clear note.—G. E. Geiger, *RCA.*

How to Make Shunts for Ammeters

It is often desirable to measure current of a larger value than a meter that might be lying around is capable of measuring. For example, it may be desired

(*Continued on page* 30)

Presenting: J. Max Ealy

J. MAX EALY, business representative of Local No. 378, Wichita Falls, Texas, was born in Corsicana, Texas, on January 18, 1896. He attended public school there and during those early years had a great ambition to become an actor. While the urge was strong, as Ealy admits, "I soon learned that I was not cut out to be an actor."

But the lure of the theatre was not completely submerged, and our subject finally got a job in a local house, paying his predecessor to quit so that he could apply for the post. There was plenty to do for the magnificent wage of $6 a week, including sweeping out the theatre each morning, putting up the posters in the front of the theatre and after that a quick delivery of handbills until the show opened. With these chores attended to he then rewound film in the projection room in addition to playing an old fashioned victrola whose horn projected in front of the theatre. The job was no sinecure, but it was there that Ealy became a projectionist, his first machine being an old two-pin Edison.

On April 4, 1914, he joined the I. A. as a charter member of the Corsicana Local No. 551 (in those days provisional charters were issued, but later on a direet charter, No. 327, was issued). In the fall of 1916 Ealy moved to Wichita Falls and had his membership transferred to Local No. 378, working there as a projectionist until the winter of 1917 when he left his job and became a railroad brakeman. That interlude, however, came to an abrupt end when one morning, about four o'clock, he rode an engine through two cabooses, half way through a loaded coal car and then into a cotton patch.

So back to the projection room went Ealy and in March, 1918, he joined the army, being shipped to France the following June. He was with the 34th Infantry, Seventh Division, and saw thirty-one days' action before the Armistice. He was discharged from the army July 3, 1919, and nine days later he was back in the projection room. He was elected business representative of Local No. 378 in 1924 and has held that office ever since. That year he attended his first I. A. Convention, which was held in Cincinnati, Ohio, and with the exception of the 1926 convention, has attended all conventions to date.

In looking back over the years Ealy says that he has always loved the theatre and could never be satisfied away from it and from the "fine bunch of fellows I have worked with over all these years."

He is married and is the father of an eleven year old daughter. His hobbies are fishing, hunting and playing golf. He is both a York Rite and Scottish Rite Mason, and is also a Shriner.

EQUIPMENT OUTLOOK BRIGHTER, RCA SERVICE MEN HEAR

RCA Service Company district managers and home office executives recently heard reports of definite improvement in theatre equipment delivery prospects at a series of meetings at Camden, N. J. Also discussed were effects of the new IATSE wage agreement, which provided for an increase in wage rates of sound service men.

It was agreed that the outlook on parts and tubes are brighter, due to easing of some restrictions by WPB. The picture is fairly good on tubes generally, RCA reported, but it is recognized that a few types will remain critically short for some time due to military needs. Tube type substitutions have been made wherever possible in such cases to ease situation.

W. L. Jones, vice president and general manager, with reference to the wage agreement, pointed out that service rates have remained unchanged for more than six years, in spite of general price and wage rises. "The latest wage boost," he said, "added to prior cost increases which RCA has absorbed, make necessary a careful examination of the present service rate structure."

HICOK RETIRES FROM W. E.

E. M. Hicok, who has been personnel relations manager of the Western Electric Company, retired on May 31 under the organization's pension plan after thirty-nine years of service. Mr. Hicok is succeeded by R. J. Pfeifer, assistant comptroller of manufacture, who became superintendent of personal relations.

TWO-LENS COMBINATION TABLE

	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
16	6.2	6.5	6.9	7.2	7.5	7.7	8.									
17	6.3	6.7	7.	7.4	7.7	8.	8.2	8.5								
18	6.4	6.8	7.2	7.5	7.9	8.2	8.5	8.7	9.							
19	6.6	7.	7.4	7.7	8.1	8.4	8.7	8.9	9.2	9.5						
20	6.7	7.1	7.5	7.9	8.2	8.6	8.9	9.2	9.5	9.8	10.					
21	6.8	7.2	7.6	8.	8.4	8.8	9.1	9.4	9.7	10.	10.2	10.5				
22	6.9	7.3	7.8	8.2	8.6	8.9	9.3	9.6	9.9	10.2	10.5	10.7	11.			
23	7.	7.4	7.9	8.3	8.7	9.1	9.4	9.8	10.1	10.4	10.7	11.	11.2	11.5		
24	7.1	7.5	8.	8.4	8.8	9.2	9.6	10.	10.3	10.6	10.9	11.2	11.5	11.7	12.	
25	7.1	7.6	8.1	8.6	9.	9.4	9.8	10.1	10.5	10.8	11.1	11.4	11.7	12.	12.2	12.5
26	7.2	7.7	8.2	8.7	9.1	9.5	9.9	10.3	10.6	11	11.3	11.6	11.9	12.2	12.5	12.8
28	7.4	7.9	8.4	8.9	9.3	9.8	10.2	10.6	11.	11.3	11.7	12	12.3	12.6	12.9	13.2
30	7.5	8.	8.5	9.1	9.5	10.	10.4	10.9	11.3	11.6	12.	12.4	12.7	13.	13.3	13.6
32	7.6	8.2	8.7	9.2	9.7	10.2	10.7	11.1	11.5	11.9	12.3	12.7	13.	13.4	13.7	14.
34	7.7	8.3	8.9	9.4	9.9	10.4	10.9	11.3	11.8	12.2	12.6	13.	13.4	13.7	14.1	14.4
36	7.8	8.4	9.	9.6	10.1	10.6	11.1	11.5	12.	12.4	12.9	13.3	13.7	14.	14.4	14.8
38	7.9	8.5	9.1	9.7	10.2	10.8	11.3	11.7	12.2	12.7	13.1	13.5	13.9	14.3	14.7	15.1
40	8.	8.6	9.2	9.8	10.4	10.9	11.4	11.9	12.4	12.9	13.3	13.8	14.2	14.6	15.	15.4

This table is designed to give at a glance the correct equivalent focus of two lenses used in combination. The above figures are correct within one-tenth of an inch for all practical purposes

TODAY, AS YESTERDAY

Brilliant

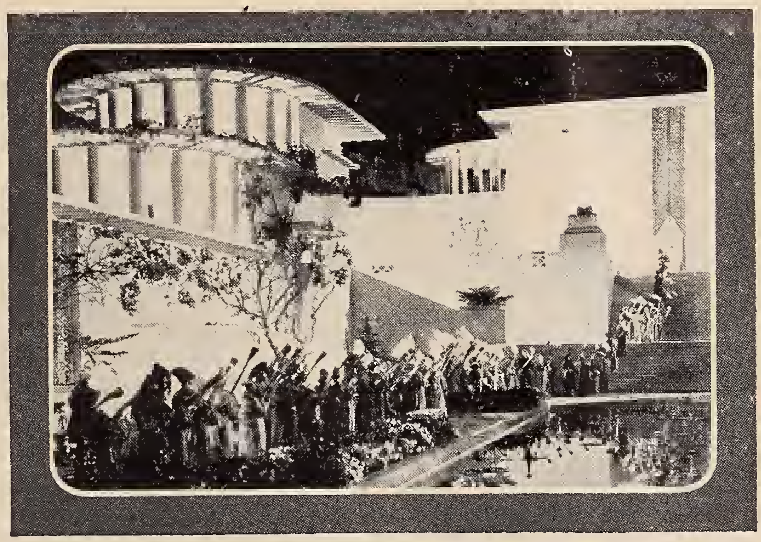
Still a brilliant film, audiences and critics agree, is Columbia's "Lost Horizon." Still brilliant, too, is the screen lighting from "National" Projector Carbons, whether the picture be the most recent release or a second or third run. Audiences enjoy virtually the same screen light today as when "Lost Horizon" was first shown.

This has been accomplished because National Carbon Company's background of research and manufacturing experience enabled it to redesign pre-war carbons promptly to war-time needs . . . and also because of the close technical cooperation of exhibitor, projectionist and lamp manufacturer.

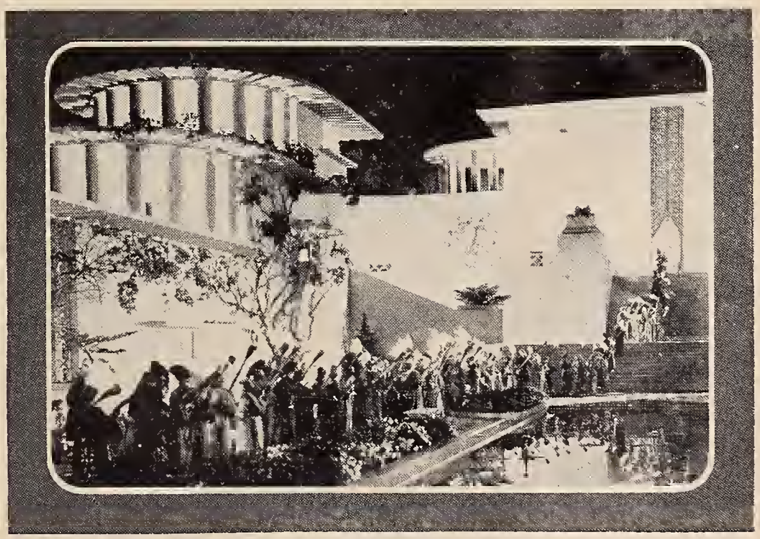
***Most important of all, however, is that enormous quantities of copper have been saved for the war effort,* through recovery of copper drippings and stripping of copper from carbon stubs.**

The best evidence that these efforts are successful is that motion picture patrons in ever increasing numbers are overflowing theatres everywhere for needed relaxation and worthwhile entertainment.

★ *BUY UNITED STATES WAR BONDS* ★



1937



1944

The trade-mark "National" distinguishes products of National Carbon Company, Inc.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

Carbon Products Division, Cleveland 1, Ohio — UCC — New York, Pittsburgh, Chicago, San Francisco

TELEVISION TODAY

IX. — Reproducers

By *JAMES FRANK, JR.*

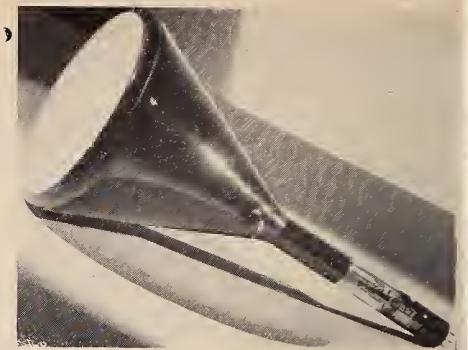


FIGURE 47. *The Kinescope*

THERE are, at the present time, a number of different devices for reproducing the television image in the receiver. Five of these are most prominent and each one will be decribed separately. It is difficult at the present time to forecast just which ones will be most universally used when television receiving instruments are again available for sale.

Two of the devices, the kinescope and the oscillight employ a fluorescent screen to produce the light. The other three, the light valve, the supersonic light control, and the skiatron, are all devices through which light is projected in the same manner as with motion picture film or stereopticon slides. It probably is safe to say that the first two have been developed to the greatest extent so far in this country and have already been used commercially in television receivers.

The Kinescope

The cathode ray tube used in the RCA television receiving system is known as the "kinescope." It is capable of producing a picture image comparable with that focused on the pick-up tube at the transmitter.

The kinescope, Figure 47, consists essentially of a glass tube with a cathode ray electron gun similar to that in the iconoscope, except that it is made to handle larger currents and to operate at higher voltages. Furthermore, since the picture is reproduced by modulating or controlling the beam current, the control grid is a much more critical item. A fluorescent screen is placed at the large end of the tube.

A diagram showing the construction of the kinescope is shown in Figure 48. The electron gun is made up of a cathode, *C*, with its emitting area coated with barium and strontium oxides. The cathode in this case operates from alternating current. The control grid, *G*, is placed around the tip of the cathode. An aperture, *O*, is located in the grid directly in front of the cathode so that the electron beam may be efficiently directed toward the first anode.

Since the grid is furnished with a negative current the electrons are repelled and forced toward the aperture. The first anode, A_1, with several apertures which guide the electron beam toward the fluorescent screen is placed in front of the grid. This first anode has a high positive voltage to accelerate the beam. Since it is desirable that the electron beam be sharply focused at the fluorescent screen to an area equivalent to the minute area scanned by the pick-up tube, further means of focusing is provided. The electrons which would naturally diverge are forced to take a path of travel near the axis of the tube by the lines of force set up. Accurate focusing is thus accomplished.

The inner surface of the tube is coated with a thin layer of colloidal graphite which acts as a second anode, A_2. This anode again accelerates the beam.

The fluorescent screen is made by coating the flat portion of the bulb with a synthetic zinc orthosilicate, very similar to the natural Willemite. (See *S* in Figure 48). The synthetic material gives off a green colored light and has high luminous efficiency. In addition to its high luminous efficiency, this material does not burn or disintegrate under electron bombardment. The phosphorescent properties of a fluorescent material are an important consideration.

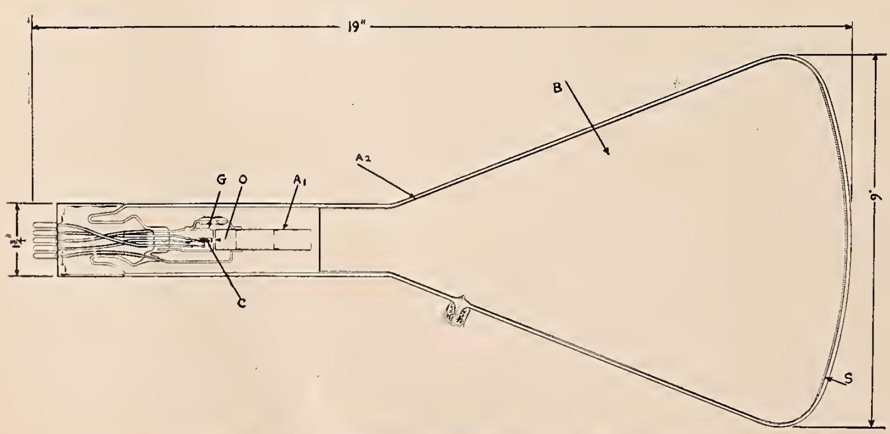


FIGURE 48. *Schematic diagram of the kinescope*

An ideal substance for television work should emit a constant amount of light for one entire picture frame and drop to zero at the end of this period. If the phosphorescent time is too long, the moving portions of a picture will leave a "trail." For example, the path of a moving ball will be marked with a comet-like tail. On the other hand, if the delay time is too short, flicker becomes noticeable. This would be caused by the period of complete darkness between pictures.

Since the pictures are reproduced, as well as picked-up, by scanning from top to bottom, it is desirable to have the screen hold the light long enough until the entire picture has been scanned. With interlaced scanning where two sets of scanning are really required for a complete picture, since only alternate lines are successively scanned, this "delay" characteristic is also desirable. Thus the phosphorescent properties of the fluorescent screen are important.

Controlling the Grid

In order to reproduce a picture image on the fluorescent screen equivalent to that focused on the pick-up tube, the intensity of the spot of light upon the screen must be varied in a proportion to the original. This is accomplished by controlling the grid. The picture or video signals received are fed to the control grid of the kinescope. These varying currents tend to control the electron beam intensity through the grid just as is done in a vacuum tube of the triode type. Thus, the illumination on the screen is a direct proportion of the incoming video signal which relates it directly to the illumination intensities of the original image at the transmitter.

It was found that the second anode also acted to carry off the secondary emission of the fluorescent screen. The electron bombardment of the screen in a short time would produce enough of a "negative charge" to repel all of the electrons unless these excess electrons were disposed of. Thus another cathode ray tube is employed to reproduce the televised image comparable to the pick-up tube in the transmitter. In this case the electron beam produces a reproduced image on a

fluorescent screen instead of scanning a photosensitive mosaic. The method of producing and deflecting the electron beam is, however, quite similar in both the iconoscope and the kinescope.

The kinescope has also been used for large screen television images by the use of an optical system which magnifies and projects the image on the fluorescent screen onto a large screen. The limitation of the intensity of the light emitted by the kinescope is an important factor in this method of enlarging the image.

The Oscillight

The cathode ray receiving tube used in the Farnsworth system is called the "oscillight." Essentially this vacuum tube consists of an electron gun, a fluorescent screen, together with a focusing and deflecting system.

The electron gun in the oscillight, Figure 49, consists of the usual type of heater type cathode. In this case it consists of a cylindrical piece of metal with a concave end facing the fluorescent screen which is coated with the usual barium and strontium oxides. A grid, cylindrical in shape but of somewhat greater diameter, is placed over the cathode. One end of the grid is closed but a small aperture is placed in this closed end. Thus the electrostatic field of the anode may pass to the cathode.

The anode is placed directly in front of the grid. It has a nozzlelike end facing the grid to stimulate a point of charge from which the lines of force originate. This permits accurate focusing of the electron beam.

Some means had to be provided to remove the charge built up at the screen end of the tube as a result of secondary electron emission from the screen. This was accomplished by providing a thin film of nickel on the inner wall of the tube which is connected to the anode. The secondary emissions are then drawn from the screen by this metallic layer.

A short focusing coil is wrapped around the neck of the glass tube. By energizing this coil accurate focusing is possible and, once set, further adjustment is not required.

Deflecting coils are required in order to horizontally and vertically deflect the electron beam in the same way as is done in the pick-up tube. In the oscillight an air core coil placed as close to the tube as possible, inside the focusing coil, is used for the horizontal deflection. This type of coil is most sensitive for reasonably high frequencies. An iron-core electromagnet, however, is used for vertical deflection. The principal advantage of this is that its effect can be restricted to a very small area and thus it minimizes interference with other circuits and coils. For the low frequencies involved in the vertical deflection the ferromagnetic type is preferable.

The proximity of deflecting coils which operate simultaneously presents several problems. The coils are, therefore, placed as far apart as practical. The horizontal coils deflect the beam first in a simple linear deflection. Specially designed pole pieces are required for the vertical deflecting coil for uniform action.

The cathode is heated by either a.c. or d.c. and it then emits electrons. A "mist" of electrons traveling in many directions and at a great variety of speeds is thus produced around the cathode. By placing an anode nearby and energizing it with respect to the cathode, it is possible to form the electrons into a stream flowing toward the anode, and by placing a hole in the anode the stream may be directed. The anode also accelerates the electron flow. If the current heating the cathode is uniform this electron stream will be uniform. A grid is placed between the cathode and anode. The picture signal received is conveyed to the grid. The grid controls the electron stream in direct proportion to the current imposed on it. The result of this control is to increase or decrease the effect of the stream on the fluorescent screen by increasing or decreasing the concentration of the electrons in the stream. As the current to the grid increases, the spot on the screen grows brighter and vice versa.

The fluorescent screen is placed on the inner surface of the end of the glass tube. The chief advantage of the fluorescent screen over other possible methods of reproducing light is its sensitivity to very short periods of excitation. It has the property of absorbing electrical energy and emitting light. Thus the screen is made sufficiently thin so that most of the light emitted passes outside the tube.

Synthetic zinc silicate closely resembling the composition of the mineral Willemite is used for the fluorescent screen. This material lends itself particularly to this use since it does not deteriorate or chemically decompose as a result of electronic bombardment, and it also emits a light of bright green which lies in the color range to which the eye is most sensitive. The intensity of illumination is, of course, directly proportional to the intensity of the electron beam. Further experiments have been completed to perfect a material for the fluorescent screen which will emit a white light.

In order then to translate the signal transmitted into a picture equivalent to that originally focused on the pick-up tube, the electron beam, varying in direct proportion to the transmitted signal, is directed at the fluorescent screen. The light emitted by the screen is proportional to the intensity of the beam and thus to the transmitted signal. All that is then necessary is to deflect the beam both horizontally and vertically just as was done in the pick-up tube. It will then trace on the screen the original picture which can be viewed from the outside.

To control the average brilliancy of the picture emitted by the screen it is necessary to regulate the grid bias or potential. In focusing the beam it is desirable that the area on the screen of the beam be equivalent to the area of the minute area scanned in the pick-up tube.

The Light Valve

The engineers of the Radio Corporation of America have developed a reproducing device known as the "light valve." This reproducer consists of a thin sheet of suspension which is bombarded by a cathode ray beam. (See Figure 50). By so doing, particles in the suspension are made opaque so that they will not pass light beams. A light source is focused on the suspension through a suitable optical system with the result that the opaque particles cut off the light and those that are not opaque pass the light beams.

Those light beams which do pass through the suspension are then enlarged by another optical system and focused on a screen of a desirable size. The size of the final projected image will, of course, depend upon the intensity of the light source which can be passed through the suspension and the optical system.

The suspension consists of small, flat, opaque particles in an insulating fluid. It is mounted, under atmospheric pres-

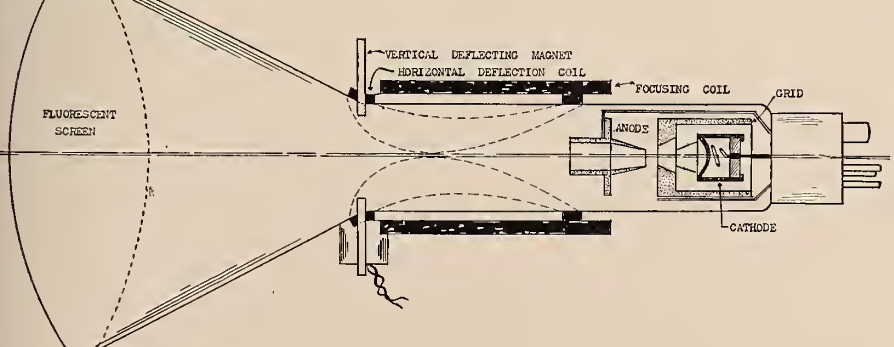


FIGURE 49. *Diagram of the oscillight*

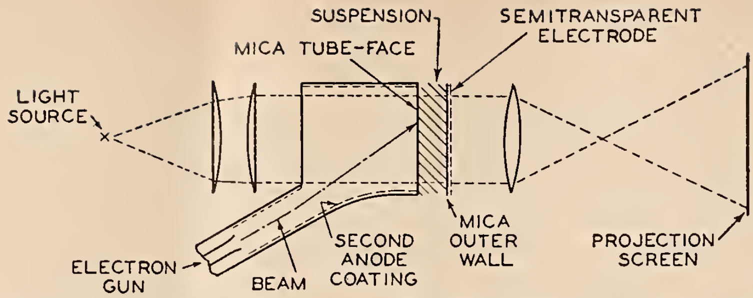


FIGURE 50. *Schematic arrangement for cathode-ray control of suspension light valve*

sure, in a chamber on the outside of the mica tube face. The other wall of the chamber consists of a second sheet of mica separated from the tube face by a spacing of 0.020 to 0.050 inch. A semi-transparent electrode is placed on the other side of the outer wall, as shown in Figure 50, and is a layer of metal sputtered on the surface of the mica.

An electron gun, similar to that used in the kinescope, is mounted at an angle with the tube face so that its cathode ray beam strikes the surface of the tube face. It is located at an angle so that it will not interfere with the projected light beam from the light source which directly strikes the suspension, passing through it and on to the screen.

To understand how this device works let us first consider an elementary light valve. One surface of the suspension is held at a fixed potential, ground potential if desired, by means of the semi-transparent conducting coating on the mica outer wall, and the desired electric field through the suspension is produced by impressing another potential or voltage on the area of the opposite wall or tube face. It is desirable to accomplish the charging of quite small areas of the tube face to a potential differing from those of nearby areas in order that the picture have some degree of detail.

A picture, as has already been mentioned, consists of a great number of minute areas with varying density. Thus each small area of the tube face must be charged with a varying potential corresponding to the varying density. The layer of suspension and the wall to be charged must be thin, comparable to the diameter of the desired picture element, if good detail is to be accomplished.

One of the simplest ways of charging the wall would be to connect one terminal of a direct current battery to the semi-transparent electrode and the other terminal to a piece of thin wire, the free end of which could be touched to the tube face or wall of the suspension. When the wire is brought near the wall the potential produces an electric field between the tip of the wire and the semi-transparent electrode. The portion of the field within the suspension acts upon the plate-like particles to orient or line them up, thus changing the light transmission of the layer at that point. In other words, the particles in the suspension are like small shutters which are all caused to be erect at the point of the charge, thus cutting off the light.

Now if the wire is moved along the wall in a straight line without changing the potential each successive area that becomes charged orients the particle in the suspension cutting off the light. If, on the other hand, the potential is varied as the wire is moved, the degree to which the particles of the suspension in each successive area cut off the light varies as the square of the potential. When the wire is moved rapidly the suspension will not respond properly unless the wire touches the wall surface.

Scanning the Picture

In the same way that a single line of the picture is produced, the wire can be made to scan other lines to orient the suspension from point to point and thereby reproduce the lights and shades of the complete picture. Thus a picture is scanned and produced as in television. Interlace scanning of alternate lines may just as easily be accomplished.

Having scanned the picture once to produce a single frame, it then becomes necessary to produce the next frame of the picture. Assuming that the second frame differs from the first, the suspended particles must first, of course, be de-oriented which can be accomplished by mechanical stirring. However, it is also necessary to remove the charge from the wall surface at the same time which is, to some degree, accomplished by leakage through the suspension. Then the next frame can be scanned and produced.

It is desirable to remove the charge from the wall surface at the same rate as it is first charged so that each area will be charged for an equal period of time and produce equivalent brightness. Therefore the entire surface should not be neutralized at one time. There are several ways that this could be performed. A second wire, held at the same potential as that of the semi-transparent electrode could be made to scan the entire picture at the same rate of travel but at a time between successive scannings of the first wire. If interlacing is employed, the discharging wire should scan in between each field scanning by the charging wire and should remove the charges from only the set of lines to be charged next.

Another way to accomplish the discharging is to have the charging wire held at the potential of the semi-transparent electrode during the scanning in alternate frames, assuming no interlacing, so that during one scanning the surface is charged and during the next it is discharged.

Still another method would be to brush the whole surface rapidly and repeatedly with a fine brush all during the scanning.

(*Continued on page* 26).

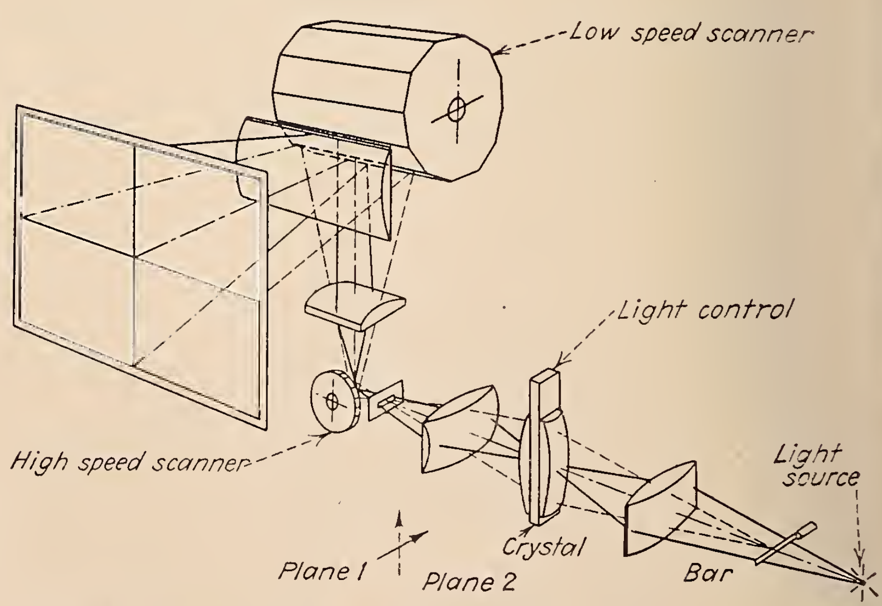


FIGURE 51. *Schematic optical diagram of Scophony receiver for home use, showing arrangement of split focus and light control*

STEP-BY-STEP ANALYSIS

(*Continued from page* 12)

that of Figure 2. This is a delta connected primary and can be symbolized by Figure 2A.

The secondaries of Figure 3, however, are not completely independent of each other as are those of Figure 2. The secondaries in Figure 3 also are delta connected.

Now the output of a rectifier's secondary windings must be connected to the units that do the actual rectifying. There are no tubes in Figure 3. Therefore the rectifying units, symbolized by the arrowheads and short vertical lines, must be of the copper oxide or copper sulphide type, or similar types. In this rectifier they are copper oxide stacks.

The rectifying action can readily be traced by considering the three transformer secondaries as if they were independent of each other, in spite of the fact that they are delta connected.

Assuming the left-hand end of the left-hand secondary to be positive, trace from positive to negative left, down, right, down, right through No. 5 stack, down. left and to the arc. In at the negative d.c. terminal, up, left, up to stack No. 1, right, up and left to the right-hand end of the same coil.

When that coil reverses polarity, trace from its right-hand end (positive to negative) down, right through stack No. 4, out and back through the d.c. terminals, left. up and right through rectifier No. 2, and back to the left-hand end of the same coil. The circuits of the other two secondaries can similarly be traced in either direction, depending on the polarity of the coil at the moment. In every case the output of the coil is submitted to full wave rectification, and current in the external circuit flows in the same direction.

In tracing from positive to negative, it is assumed the current moves with the arrowheads and will not flow against the direction of the arrow. In tracing the true direction of current flow, from negative to positive, it is assumed the electrons move only against the arrows and never with them. Of course the arrows could be drawn the other way round, but convention in every drawing of this kind requires that they point from positive to negative, and every stack rectifier schematic can be interpreted accordingly.

The reader will note that Figure 3, aside from its auxiliary circuits, is simpler than Figure 2. The essential reason for this is that Figure 3 has no filaments, filament secondary coils or filament wiring.

NEW DISTRIBUTION AGREEMENTS

Homer B. Snook, sales manager of the theatre equipment section of the Radio Corporation of America, announces the conclusion of new distribution agreements with 24 theatre supply dealers from Boston to Los Angeles and from Tampa, Fla., to Portland, Ore. It is expected that additional dealers will be signed shortly, Mr. Snook said, to provide full coverage of the 30 film territories in the United States.

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TELEVISION TODAY

(*Continued from page* 24)

Each brushing would carry the potential of the surface only part way toward the potential of the electrode. This last method is similar to the one used with an electron beam.

It can be seen that a television picture of low resolution or detail and low frame frequency might be reproduced if the difference of potential between the wire and the semi-transparent electrode were modulated or varied in accordance with the lights and shades of the picture. By projecting a very intense light through the valve, a bright image could be produced on a screen. The moving wire would not, of course, be acceptable for modern television. Thus, a cathode ray beam can do a much better and quicker job.

The light valve is then made to produce a television image by directing the cathode ray beam onto the mica tube face, actuating it so that it will scan the tube face in alternate horizontal lines, as is done in a kinescope. The strength of the beam is modulated or varied by the television signal being received and it produces areas of light and shade in the suspension that are directly proportional to the original picture focused on the television camera. The tube face is discharged by keeping the electron beam unmodulated and at the potential of the semi-transparent electrode during alternate scannings. This overcomes a lot of technical problems that arise through the use of any other method.

When the light valve is fully perfected it should offer a very satisfactory means of producing a television image by projection on a screen of any reasonable size. Whether it will be limited to use with large screen images, such as for theatres, or in the home on smaller screens as well depends on the need for images of a size larger than can satisfactorily be obtained from devices such as the kinescope.

Complete Specifications for 16-mm Projector

Through co-ordinated efforts of representatives of industry, the armed forces and the War Production Board, working through the American Standards Association, specifications that will help manufacturers to turn out a tough and easily portable 16-mm sound motion picture projector for the armed forces have been completed. It is expected that these specifications will be used as the basis for a joint Army-Navy specification.

This is by far the most important job completed to date by the War Committee on Photography and Cinematography of the American Standards Association, which has been working since January of this year on special standardization problems of photographic and motion picture equipment and supplies at the request of the armed forces.

Projectors built to these specifications, it is said, will compare favorably as to quality of the image and the sound with 35-mm projectors used in theatres. The projector is designed to withstand life in the rear of a jeep and to give long service in the moisture-laden atmosphere of the South Pacific. For ruggedness and dependability of performance these specifications call for an operating performance which surpasses any 16-mm projector at present on the market. It is claimed that for audiences up to about 300 it should be the answer to the armed force problem of how to bring training and entertainment films to the far flung battlefronts of this war.

An important feature of this proposed motion picture projector will be the ease with which it can be serviced. The development specifications call for easily interchangeable lenses, tubes, and other parts that will make these projectors easy to repair at isolated bases.

Work on this specification was carried out under the chairmanship of A. G. Zimmerman of Radio Corporation of America, and the vice-chairmanship of J. A. Maurer, of J. A. Maurer, Inc. It was then submitted to the War Committee on Photography and Cinematography which was set up by the ASA at the request of the War Production Board on the initiative of the Army Pictorial Service. The Society of Motion Picture Engineers and the Academy of Motion Picture Arts and Sciences co-operated to the fullest extent.

IN THE SPOTLIGHT

(*Continued from page* 17)

M. Jacobson, I. A. representative, District No. 1, Tacoma, Wash.; Vernon Hall, Austin, Tex.; Lawrence Katz, Harrisburg, Penna.; George McDonald and George H. Hess, St. Louis, Mo.; Ben Pinzel, Buffalo, N. Y.; Howard Jackson, Omaha, Nebr.; James A. Sesse, Waterloo, Iowa, and many others.

● We enjoyed a very pleasant chat with former I. A. president, William C. Elliott, who obligated the newly elected officers. Bill hasn't changed much and still retains his swell sense of humor.

● We remember way back in 1926 when Mrs. Cliff Clower was the prettiest woman at the Cleveland convention. Cliff, Local No. 41, Atlanta, Ga., attended this convention alone and he informed us that his wife was just as pretty as ever, with nary a gray hair on her head.

● Jimmy O'Brien, Local No. 11, Boston, Mass., informed the convention of the death of brother Pat Barry. Barry was the ninth president of the International Alliance, serving two terms. He was elected president in 1903 and was reelected the following year—in those days I. A. conventions were annual affairs.

The entire delegation stood in silence for one minute in tribute to this old-timer, and the secretary-treasurer was requested to send a laurel wreath to his survivors.

● Ed Whitford, former secretary of Local No. 376, Syracuse, N. Y., is now stationed at Camp Sampson, N. Y., where he is taking his boot training as a gob in Uncle Sam's Navy. George Raaflaub is now the new secretary of the local, with Andy Seeley the new business agent.

● Our good friend, Bill Kunzman of National Carbon, was very much in evidence showing his usual hospitality to the delegates. He was ably assisted by Al Woff, a pleasant mannered chap. Bill has been attending I. A. conventions for many years and he is well-known to most of the delegates.

● F. C. Cromer, president and business agent of Local No. 127, Dallas, Texas, was the first baggage victim at the convention. Although his baggage was lost for several days, Fred let nothing wipe that happy-go-lucky grin from his rotund countenance. (Wonder what that great big rubber girdle was doing in his bag?)

● Morris Roizman and Nathan (Cy) Braunstein, Film Editors Local No. 771, New York City, threw a party to those men who helped them in some way to get an I. A. charter for the local. Father Growney (who made such a tremendous hit with the delegates at the convention) and Judge Matthew Levy were specially invited guests. The I. A. was represented by vice-president Jimmy Brennan and

secretary-treasurer, Louis Krouse. Among the guests at the party were John Francavilla, Local No. 702; James A. Delaney and William J. Gerrity, Local No. 52; Ray Rescher, Walter A. Lang, and Douglas Dupont, Local No. 644; George Cline, Local No. 161; Herman Boritz, Morris Kravitz, Joe Basson and yours truly (what, again?) of Local No. 306.

● Jim McNabb, business agent, Local No. 154, Seattle, Wash., is still boasting of the trimming he gave Arthur Meyer, National - Simplex - Bludworth, in that poker game. He would like Meyer to return to Seattle for another little game of poker—he enjoyed the lost one so much!

● William Strome, Local No. 514, Bellefontaine, Ohio, spent most of his free time visiting St. Louis Masonic lodges. Strome is the Junior Warden of High Noon Lodge No. 635, of Cincinnati.

● The birthday of Mrs. Andreus, wife of Boyd Andreus, business agent of the Olympia, Wash., Local No. 344, fell during the convention week and was the occasion for a celebration. Many happy returns of the day, Blanche.

● Smiling Bob Hulett of Local No. 163, Louisville, Ky., is the proud father of four sons now serving with the armed forces. During the twenty-odd years we have known Bob, we have always found him to be the same—smiling and courteous—always the gentleman. Here are our best wishes for the safe and victorious return home of the four Hulett boys.

● The St. Louis Convention Committee deserves much credit for its smooth handling of all matters during convention week. The members were given a rising vote of thanks for their untiring efforts in planning for the entertainment of the delegates and their wives. The Local No. 6 committee members were Elmer V. Moran, chairman, LeRoy Upton, Wm. L. Kostedt, Sr., Charles Reilly, James F. McGinn, and Charles LeRoi. Local No. 143 committee members were Wm. Lee, Jr., chairman, Walter J. Schaefer, Edw. Bostelman, Carroll Rice, Wm. Horton, and F. Noertemann.

● A study in contrasts: The thick mop of hair on the head of Bill Bordonaro, of Local No. 444, New Kensington, Penna., and the rather anemic wisp of something or other adorning (?) the upper lip of Charlie Brunner, the newly elected secretary of the 4th District and member of Local No. 130, Altoona, Penna. Perhaps these boys could get together and effect a transfer of a few strands of hair from the head of Bordonaro to Charlie's upper lip. Bill wouldn't miss them and Charlie certainly could use them. Some fun—some pickings!

● Frank (Bumps) Coogler, Local 279, Houston, Texas, had a just complaint. He was one of the eight tellers counting the ballots. Bumps remained at his post in a hot room from 8 o'clock in the morning until the last vote was cast, with only a corned beef sandwich for sustenance. Darned good thing he has enough of his own fat reserve to fall back on.

● We were happy to see our old friend Murray Smyth, business agent of Local No. 183, Beaumont, Texas, up and around again. Murray had been ill for some time and seeing him at the convention gabbing with the boys was a treat for sore eyes.

● William F. Canavan, former I. A. president, who makes his home in St. Louis, appeared at convention headquarters every afternoon. Bill and Mrs. Canavan, who accompanied him, had a busy time greeting scores of old friends.

● A very interesting unofficial meeting of the New York State Projectionists Association was held at the De Soto Hotel. Many subjects including television were discussed. A delicious din-

ner and customary refreshments was served. Speakers at the dinner included P. A. McGuire, Simplex; Herman Gelber, Frank Inciardi, Nat. Doragoff, Harry Storin, Charles Beckman, Morris Kravitz, Eddie Stewart, Ben Scher, James Ambrosio and yours truly, all of Local No. 306. Glenn Humphrey acted as chairman and Charles Wheeler was the secretary.

● We were constantly running into Emile L. Beaud, Local No. 293, New Orleans, La., who was busy taking pictures with his movie camera. Due to its scarcity, he used the film for taking shots of a selected number of friends.

● We tried a number of times to catch up with RCA's Homer Snook, but we were either too late or too early.

● Once again Floyd Billingsley, I. A. third vice-president, was re-elected to office sans opposition. Billingsley is also business agent of Local No. 162, San Francisco, Calif., and is one of the most popular I. A. officials on the west coast.

● Judging from their shouts on the convention floor, there is nothing wrong with the vocal cords of Charlie Herring and Roy Munson, Sioux Falls, S. Dak., delegates. We believe these boys could make themselves heard above the roar of cannon fire.

COLLINS ADVANCED BY W. E.

D. C. Collins, who was Eastern manager of Western Electrics Electrical Research Products Division, has been advanced to the post of manager. He will continue to report to T. K. Stevenson, vice president of the company, and formerly president of ERPI.

Mr. Collins, upon his appointment, said: "At present we are directing our engineering facilities to the development of equipment vital to the war effort, but this work is primarily the continuation of sound engineering in a broader field, from which should come many improvements of benefit to the motion picture industry.

"Our organization is keenly aware of the motion picture industry's interest in television and here again developments resulting from the war should aid materially in the utilization of television and in its adaptation to the entertainment field."

In discussing the industry's part in the war effort Mr. Collins said that "Western Electric field engineers, returning from various remote military outposts, tell me that more than 80 per cent of our soldiers and sailors find their chief recreation in American made motion pictures, shown in both 16-mm and 35-mm form by American made sound projection equipment."

KNUTSON SIGNS WITH ALTEC

Sound service and repair and replacement parts agreements have been signed by the Knutson Circuit of theatres with Altec Service Corporation, Barclay Ardell, Seattle district manager, announces. Knutson operates theatres in Livingston, Miles City and Harlowton in Montana, and in Hailey, Idaho.

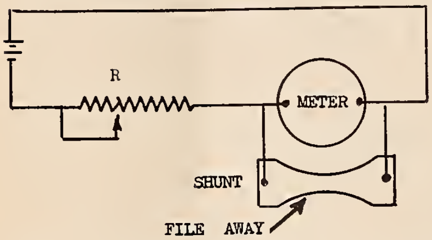
AT YOUR SERVICE

(*Continued from page* 18)

to measure a lamp current of 50 to 60 amp. and the meter on hand will measure only 10 amps. A proper shunt may be made as follows:

Referring to the drawing below, adjust the rheostat "*R*" until the meter reads 10 amps., and then install the shunt and file away the sides until the meter reads 1 amp. After this alteration is made, disconnect the battery and rheostat "*R*" and permanently connect the shunt. The meter will now read 100 amps. It is not necessary to remark the 10 amp. scale on the meter, merely multiply all readings by the factor 10.

This method of making shunts for



meters is 100% accurate. If there are any discrepancies, it will be in proportion to the accuracy of the original calibration of the meter and the temperature coefficient of the shunt. Meter manufacturers use Manganin, but copper or iron will be satisfactory for most practical purposes.—*ALTEC.*

Conservation of Stabilizer Springs

I save broken stabilizer drive springs for emergencies because they can temporarily be used in pairs until a new spring is installed.—H. M. Morrow, *RCA.*

Emergency Gear Puller

Two 4" C-clamps and a heavy metal strip will serve nicely as a gear and flywheel remover. Place one of these clamps under each end of the flywheel, then set the metal strip across the shaft end. Place other end of C-clamps on the metal strip and tighten. Since pulleys of any kind are not available, this improvised device is recommended for the purpose outlined. Shaft and motor are less likely to be injured when trying to drive the parts off.—W. Armstrong, *RCA.*

Feed-back in Portable 35-mm Equipment

In using 35-mm equipments for non-theatrical set-ups, attention should be paid to the possibility of feed-back from the speaker cable to the amplifier input circuit. Normally, these equipments are provided with several hundred feet of speaker cable to accommodate unusual amplifier-speaker circuit paths. Even with the careful shielding of input circuits, there may still be feed-back from the unshielded cable, especially if an excess of speaker cable is used and placed near the amplifier. This shows up as a high pitched whistle at high gain settings, and may be remedied by the use of the least amount of cable needed so as to reduce shunting capacity to the input —and by the use of grounding to a waterpipe—not conduit.—L. P. Work, *PROJ. DEPT., JAM HANDY,* DETROIT.

Conservation of Power Unit Sockets

Since power unit rectifier sockets are among the critical items and difficult to obtain, many rectifier bulbs have been discarded and classified as defective because of poor contact in the rectifier bulb socket resulting in an unstable d.c. exciter lamp current.

An excellent contact may be effected by first tightening all the socket screws and then soldering the screws in the female section to both of the pressure contacts of the terminal strip. By using a small quantity of paste flux, strong permanent solder bonds are achieved.—D. E. Howard, *RCA.*

W. E. EXPORT CORP. PERFECTS NEW SOUND SYSTEMS

A new line of sound reproducing systems which embrace the many advances in technology evolved during the war is announced by E. S. Gregg, vice president of the Western Electric Export Corporation. This new equipment will become available to exhibitors in foreign countries when materials and labor are released by the government. Mr. Gregg declared that the new systems will take any of the probable developments which motion picture producers may introduce after the war such as automatic volume control track, multi-track, or stereophonic sound with minimum expense and adaption. They will have many times the power of pre-war systems and will be simpler to install and operate, and will be more efficient.

"We want exhibitors to know that they will not have to depend on hastily manufactured pre-war models or on reconditioned equipment after the war is over," Mr. Gregg said. "Design changes resulting from the application of new basic principles make the system definitely superior to any now existing."

MOTION PICTURE INDUSTRY COMMENDED BY RED CROSS

The motion picture industry played a major part in the tremendous success of the 1944 Red Cross War Fund campaign, according to Red Cross Chairman Norman H. Davis who stated that "without the assistance of the War Activities Committee of the motion picture industry, its associated theatres, studios, and the industry as a whole, the campaign probably would not have exceeded the $200,000,000 goal." He credited the industry with visually informing the public of Red Cross activities, conducting Red Cross Motion Picture Week, and generously contributing to the war fund.

The leadership of Joseph Bernhard, chairman of the Motion Picture Industry's Red Cross Week, was credited with making the industry's participation in the campaign outstanding, with more theatres participating in the event than ever took part in any similar appeal in the industry's history.

RCA EQUIPMENT KEEPS THE SHOW GOING

Staff Sergeant William L. Cooper, of Providence, R. I., attached to the special services section, in a letter to his parents took great pride in stating that he put on a movie show the way he wanted it. With a new theatre in New Guinea equipped with RCA sound equipment, he said it is loud and clear enough for thousands to hear at one time. "I had a spotlight playing on the screen," he wrote, "while I used a revolving color wheel. I had records played until the title of the film passed by. Then with the large driver speakers of RCA quality, pure and undistorted sound blossomed forth to 5,000 men or more. To top it off I had two projectors operating in dual with changeover switch. So I ran a non-stop show."

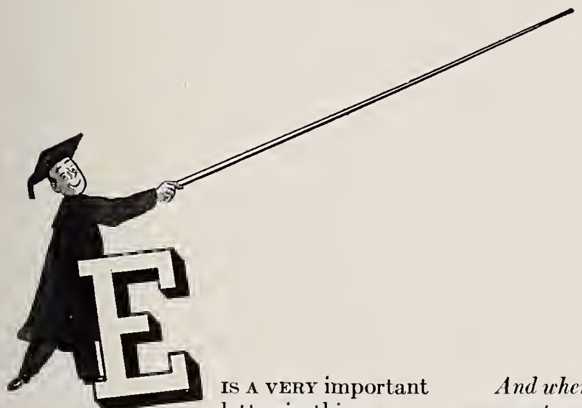
Frank M. Folsom, vice president in charge of RCA Victor Division, Camden, N. J., received the sergeant's report on movies in the Southwest Pacific through his parents. In a letter to Sgt. Cooper, Mr. Folsom wrote in behalf of the men and women of RCA Victor: "We are very proud of the many important functions which RCA sound-movie equipment is performing in training and in providing entertainment for our armed forces."

POST-WAR PROSPECTS FOR DRIVE-INS DISCUSSED

A series of meetings were held recently by RCA's Theatre Equipment Section at Camden, N. J., at which plans for distribution of sound and projection equipment for post-war drive-in theatres and for large screen television were discussed. Salesmen and executives of RCA attended the conferences.

Also discussed were new products in the theatre equipment line, soon to be announced. Homer B. Snook, sales manager of the theatre equipment section, outlined prospects for manufacture of sound and projection equipment for the remainder of the year, and declared that sound equipment delivery prospects are definitely brighter for the second half of the current year. Projection equipment deliveries probably will show some improvement, he said, but to a lesser degree than that foreseen for sound equipment.

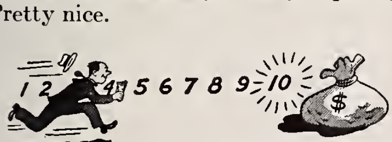
Some ABC stuff about E



E IS A VERY important letter in this war.

It's the name of the War Bonds you buy—"War Savings Bond Series E."

As you know, a Series E Bond will work for you for ten full years, piling up interest all that time, till finally you'll get four dollars back for every three you put up. Pretty nice.



The first job of the money you put into "E" is, of course, to help finance the war. But it also gives you a wonderful way to save money.

And when the war is over, that money you now put away can do another job, can help America swing over from war to peace.

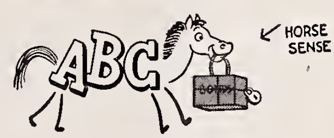
There'll come a day when you'll bless these Bonds—when they may help you over a tough spot.

That's why you should make up your mind to hang on to every Bond you buy. You can, of course, cash in your Bonds any time after you've held them for 60 days. You get all your money back, and, after one year, all your money plus interest.

But when you cash in a Bond, you end its life before its full job is done. You don't give it its chance to help you and

the country in the years that lie ahead. You kill off its \$4-for-every-\$3 earning power.

All of which it's good to remember when you might be tempted to cash in some of your War Bonds. They are yours, to do what you want with.



But . . . it's ABC sense that . . .

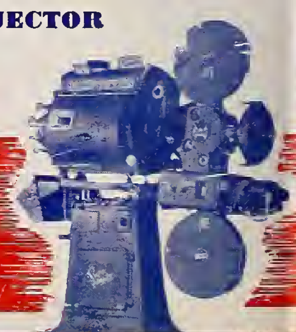
They'll do the best job for you and for America if you let them reach the full flower of maturity!

WAR BONDS to Have and to Hold

The Treasury Department acknowledges with appreciation the publication of this message by

INTERNATIONAL PROJECTIONIST

The Parade, Balboa, Panama



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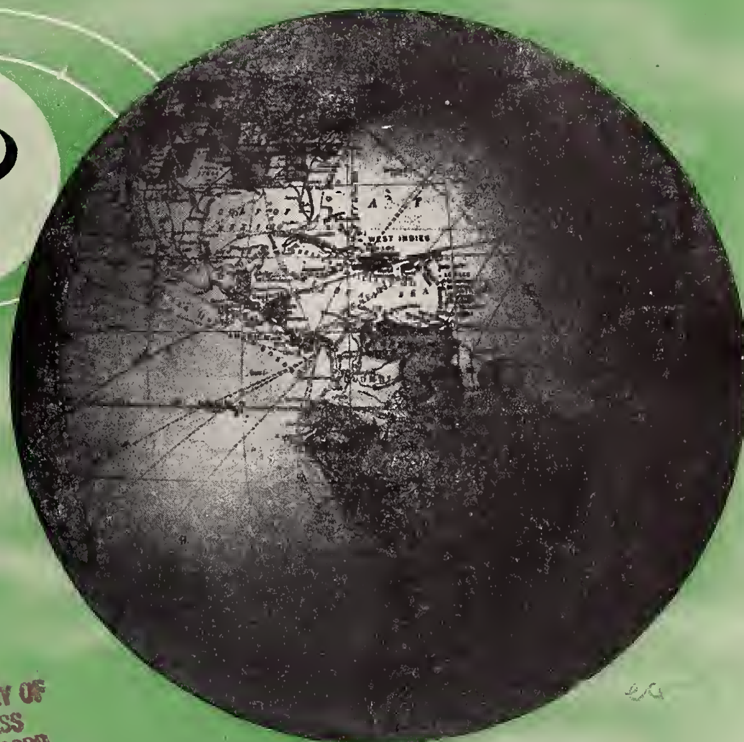

JULY 1944

VOLUME 19 • NUMBER 7

25c A COPY • $2 A YEAR

He won't dodge this-

Don't *you* dodge this!

The kid'll be right there when his C. O. finally gives the signal . . .

There'll be no time to think of better things to do with his life. THE KID'S IN IT FOR KEEPS—giving all he's got, *now!*

We've got to do the same. This is the time for us to throw in everything *we've* got.

This is the time to dig out that *extra* hundred bucks and spend it for Invasion Bonds.

Or make it $200. Or $1000. Or $1,000,000 if you can. There's no ceiling on this one!

The 5th War Loan is the biggest, the most vitally important financial effort of this whole War!

5TH WAR LOAN

Back the Attack! - BUY MORE THAN BEFORE

This is an official U. S. Treasury advertisement—prepared under the auspices of Treasury Department and War Advertising Council

COPPER

still critical!

COPPER is still on the critical shortage list of essential war materials. It was never more necessary that every last possible ounce of it be saved.

The copper that drops from your Victory and "Orotip" Carbons to the bottom of your lamp housings, and that which you strip from stubs, quickly finds its way back into essential products of war when you turn it in to your distributor or local salvage headquarters.

Your cooperation has been most effective. Your Government urges you to keep it up! And for further saving of copper . . . and for efficient use of carbons . . . a bulletin describing completely the operation of Victory High Intensity Carbons . . . "National," "Suprex," and "Orotip" . . . has been in general distribution. If you have not received your copy, write today. National Carbon Company, Inc., Cleveland 1, Ohio, Dept. 10-G.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

UCC

General Offices: 30 East 42nd Street, New York 17, N. Y.

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The registered trade-marks "National," "Suprex," and "Orotip," distinguish products of National Carbon Company, Inc.

★ BUY UNITED STATES WAR BONDS ★

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

IMPORTANT to every projectionist is the series of articles on basic radio and television which makes its first appearance in this issue of I. P. When the war dogs again are chained and the world returns to something approaching normalcy television will be released in this country on a widespread scale and will invade motion picture theatres as well as homes. Many opportunities to cash in on the trend will be available to projectionists, and with this in mind I. P. has gone to considerable trouble and expense to present to its readers as much informative material on the subject as possible. This new series of articles is regarded by the editors as among the most important ever carried by a trade publication. They will prove themselves invaluable to those who are anxious to get in on the ground floor of the television era in the theatre.

We suggest that these articles should be saved either as bound in the magazine or separately. With the present paper shortage, it will be practically impossible to furnish back copies of the magazine at some future date.

• • •

There has been a slight delay in the publication of "Projectionists' Service Manual," the book of the year for the craft. This delay was beyond our control, for it is impossible to depend upon book printing schedules during the wartime period. However, the manual will be off the presses by the first of the month, at which time orders will be filled as quickly as possible. As the edition is limited those who wish to be assured of their copy should send in their order at once. "It's better to be early than sorry!"

• • •

We have had plenty of hot weather this month, and while our editorial rooms are not as hot as many other places—including the average projection room—it is plenty hot. We get some recompense, however, in the thought that we are spreading a little knowledge each month. At the same time the projectionist who may bemoan his own particular niche during the torrid days may feel compensated in the thought that he is doing outstanding work in building morale during the war period. Both for civilians and those in the armed services. It's a mighty important job, so next time you feel like chucking it remember you're a big cog in the wheel that keeps spirits up, production at capacity, and our armed forces happy while they are on leave.

• BUY WAR BONDS •

INTERNATIONAL PROJECTIONIST

VOLUME XIX JULY 1944 NUMBER 7

Projectionists' Course on Basic Radio and Television

By *M. BERINSKY, E. E.*
MEMBER OF INSTITUTE OF RADIO ENGINEERS

I.—THE NATURE OF ELECTRICITY

This is the first of a series of articles on basic radio, television and electricity written especially for the readers of I. P. The author, a graduate of the Massachusetts Institute of Technology and member of the Institute of Radio Engineers, has been conducting courses on these subjects for the past two years for the members of one of the largest local unions in the Alliance. The articles are written in the language of the layman and are devoid of complicated mathematics. We suggest that the readers carefully study them and, without a second reference to the written material, answer the questions appended to each article. The correct answers will appear in the following issues.

As an added service to our readers, the author will be glad to answer all questions on electricity, radio, sound, and television. Questions pertaining to specific equipment should contain the name and model number. Address all communications to this magazine.

RADIO, sound equipment, and television have one thing in common—they all depend upon electricity for their operation and motivation. To achieve proficiency in these subjects a knowledge of the fundamentals is essential. First, what is electricity? This question seems to be a very simple one to answer, and yet a complete answer never has been given. A famous scientist stated recently that 96% of our knowledge as to the true nature of electricity has not been expounded to date. The phenomenon that is electricity has been known to civilized peoples for many centuries. The ancient Greeks discovered that when an amber rod was vigorously rubbed on a piece of cloth it acquired the property of attracting to it small pieces of paper, cloth, dust, and other non-metallic substances. It is from the Greek word "electron" meaning amber, that the word "electricity" was derived.

Although our knowledge of electricity is limited to some extent, we have been able to find out a great deal about its nature, its effects, and its applications. We know, for example, that all forms of matter contain some electrical charges. But what is matter? Everything that goes into the make-up of our universe may be classified as matter. The air that we breathe, the water that we drink, the ground that we walk upon, all are considered to be what we call matter.

Matter exists in three fundamental forms, or "states," as they are called by scientists. The three states of matter are (1) the solid state, (2) the liquid state and (3) the gaseous state. The application of varying degrees of heat to matter will result in a change of state taking place.

Let us first consider a piece of ice (matter in the solid state). When the ice is in physical contact with any body that is warmer than 32 degrees F., it will slowly begin to melt until it turns into water. A change of state has taken place and the solid piece of ice has now turned into a liquid. Any further application of heat will have little effect upon the state of the liquid, until enough heat is added to cause the water to become vaporized. When the water has begun to vaporize, it will turn into steam, and we know that steam is a gas. The reason why these changes take place in various kinds of matter is because changes take place in the tiniest particles from which matter is composed. The number and arrangement of these extremely small particles is responsible for the existence of many different kinds of matter, all reacting in their own way to the influence of electricity.

Atoms, Molecules and Electrons

All matter is made up of 92 fundamental constituents called elements. Matter made up of only one element is said to exist in the free state. Examples of free elements are iron, copper, carbon, tungsten, aluminum, radium, gold, and silver. These free elements may be broken down into very minute particles, so small that billions of them could be

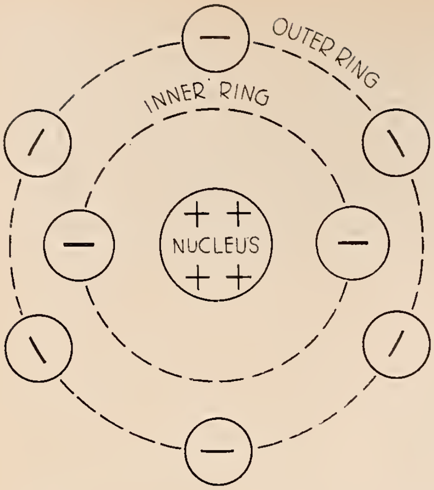


FIGURE 1. ***Diagram of an atom, showing how electrons revolve around a positive nucleus. Only two rings are shown here. The electrons on the inner ring are tightly held to the atom; those on the outer ring are loosely held and can be easily removed.***

placed on the head of a pin. The smallest particle which still retains all the original characteristics of an element is called an atom.

Some types of matter are combinations of free elements and these are called compounds. Examples of compounds are air, water, brass, steel, and bakelite. Air and water are made from two free elements, hydrogen and oxygen; while brass is composed of copper and zinc. The smallest particle of a compound which still retains all of the original characteristics of that compound is called a molecule.

The most modern theory of the nature of electricity is based upon the structure of the atom. An atom consists of a heavy central part, called the nucleus, around which very tiny particles of electricity, called electrons, revolve. Reference to Figure 1 will show a simplified picture of an atom. Most of the weight of the atom is contained in the central portion (nucleus).

The atom may be compared to the solar system. We all know that the earth and all the other planets of the universe revolve in elliptical orbits (paths) around the sun. Some of the planets move in paths which are close to the sun, while others move in orbits very distant from the sun. The nucleus may be considered as the sun, and the tiny charges of electricity as the planets. Those charges which follow paths that are near the nucleus are tightly bound to the atom and can only be removed by the application of tremendous pressure, while the charges which are further removed from the center of the atom can be made to leave the atom by the application of relatively small pressures. Commercial electricity is possible only because some electrons can be forced to leave their atoms.

Positive and Negative Electricity

Now that we have discussed the construction of the atom, let us investigate its electrical characteristics. The nucleus was found to contain an electrical charge which was unlike the electron. Scientists called this charge positive, and designated it with a plus sign (+), while the electrons were called negative charges and were designated by a minus sign (—). Also, the positive charges are sometimes called portons. An electron is, by definition, the smallest possible charge of negative electricity.

Electricity exists in two forms, static and dynamic. Static electricity is electricity at rest, while dynamic electricity is electricity in motion. Electric power of the type used in our homes, regardless of whether we use alternating or direct current, is electricity in motion, and, therefore, dynamic electricity. When a person walks on a heavy rug he usually will generate static electricity due to friction between his shoes and the rug. If he should pick up a telephone or other metallic object he would experience an electric shock because the charges generated at the rug would discharge through his body. This type of electricity is at rest, because once discharged it disappears, unless more friction is applied to the rug. Static electricity is easily created by friction. The voltages generated by friction can be very large and will sometimes cause a large spark to jump between two points, thereby creating a fire hazard. For this reason all motion picture projection equipment is grounded. The charges will then leak off to ground before a spark can be created near the highly inflammable film. Gasoline delivery trucks have many heavy chains dangling on the ground for the same reason.

Charged and Neutral Bodies

All types of matter would like to remain in a neutral or uncharged state. We know that if we should touch a piece of wood, paper, or steel, we would not experience an electrical shock provided that these substances were not acted upon by friction or electricity. We consider these substances to be electrically neutral, and their average charge is zero. They still have atoms and their atoms contain positive and negative charges, but because these atoms are in a state of equilibrium, the positive charges are equal in strength to the negative charges. The positive charges will cancel out the negative charges and the net charge of the substance will be zero.

Suppose that we could remove one or more electrons from a neutral atom. The atom then would have a deficiency of electrons and it would be left with a positive charge. On the other hand, if we could take one or more electrons from one atom and give it to another, the atom which received the electrons would then be negatively charged because it had an excess of electrons. Notice that we do not speak of positive charges as moving from atom to atom, only electrons are free to move.

Electrons may be transferred from one atom to another by the application of heat, light, chemical action, friction, electrical pressure, and mechanical vibration. Run a comb through your hair, then hold the comb near a tiny piece of paper. The paper will be attracted to the comb. This attraction is due to the fact that opposite charges appear on the two objects.

Here is what really takes place. When you run the comb through your hair, the friction between comb and hair results in a loss of electrons by the hair and a gain of electrons by the comb. The hair is then left with a positive charge and the comb with an excess of electrons or negatively charged. You might wonder why the opposite did not take place. When some objects are rubbed against others they will always assume either a positive or a negative charge. For example, a hard rubber comb will always become negatively charged when rubbed against hair or flannel. On the other hand, if a glass rod is rubbed against a piece of silk, the act of rubbing will tear away a number of electrons from the atoms that make up the glass rod, leaving the rod with a positive charge. What happened to the electrons? The silk gained these electrons and is, therefore, negatively charged. The two conditions just mentioned are illustrated in Figure 2.

We mentioned that if a charged comb

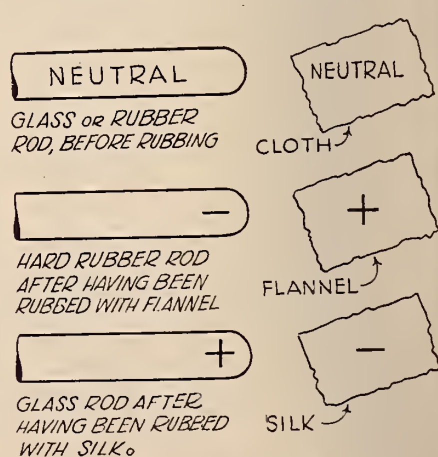


FIGURE 2. ***Before rubbing, both rod and cloth are neutral. When the rubber rod is rubbed against the flannel it gains electrons and becomes negatively charged, while the flannel loses electrons and becomes positively charged.***

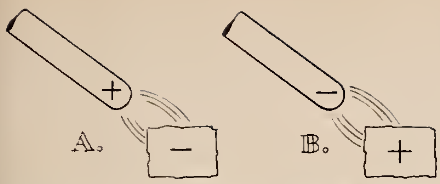


FIGURE 3. *A and B originally were neutral. When a positively charged body was brought near A, it induced a negative charge on A. Part B shows that the opposite also is true.*

were held near a piece of paper, the paper would be attracted to the comb. This leads to a basic law of electronics—a negatively charged body will induce a positive charge in a neutral body near it, and conversely, a positively charged body will induce a negative charge in a neutral body near it. (See Figure 3.)

When the negatively charged comb was brought near a piece of neutral paper, a positive charge was induced on the paper. The paper was then attracted to the comb. Since the comb was negative and the paper positive, and since attraction took place between them, we may safely assume that a positive charge will attract a negative charge. The opposite also must be true. In general, we can say that *unlike charges will attract each other.*

What effect would one negative charge have upon another? You probably guessed the answer—they would repel. A positive charge would also repel another positive charge, leading to the next important rule—*like charges will repel each other.* Our entire concept of electricity depends upon these two laws. Reference to Figure 4 will further clarify their meaning.

Figure 5 shows how charges are distributed on an irregularly shaped body. These charges create electrostatic lines of force which are assumed to originate on a positive charge and terminate on a negative charge. When these charged bodies are close to each other a spark will jump from one body to the other and the charges will be neutralized, leaving both bodies without any charge, that is, neutral.

Figure 6 illustrates the distribution of electrostatic lines of force first between two parallel plates, and then between a plate and a sharply pointed body. Notice the heavy concentration of lines of force on a pointed body—all charges concentrate at a point. Because of this fact sharp points are avoided on all high voltage apparatus, since a heavy concentration of charges will result in a breakdown of insulation. This is especially true on transformers where extra insulation is used at all sharp points. Lightning rods are purposely pointed for this same reason. It is desirable to have this concentration in a lightning rod. In practice the rod is mounted on a roof for protection from electrical storms. When lightning strikes near a building it is attracted to the pointed rod. It strikes the rod, but the rod is grounded to a water pipe, and the charges are safely conducted to ground where they are rendered harmless.

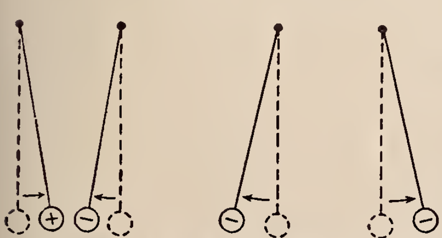


FIGURE 4. *The dotted lines represent the original position of two pith balls. When these pith balls are charged with like charges they will repel each other. If their charges are of opposite polarity they will attract each other.*

Electron and Current Flow

So far we have been concerned only with static electricity. Let us now consider dynamic or moving electricity. Whenever different charges are present between two points an electrical pressure will also appear between these two points. We call this pressure by many different names as potential differences, electrical pressure, voltage, and electromotive force. The most common name is voltage. This voltage causes a drift of electrons from negative to positive, and we say that electrons flow *from minus to plus.*

A flow of electrons constitutes an electric current. Perhaps you have been told that current flows from plus to minus. This was believed to be the case until recently. Electrical books still teach that current flows from plus to minus, but the

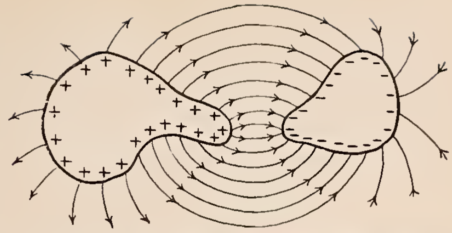


FIGURE 5. *This diagram illustrates the distribution of electro-static lines or charges on an irregularly shaped body.*

latest works on radio and television teach the modern electron theory. Figure 7 illustrates both theories.

Conductors, Resistors, Insulators

We have learned that all types of matter contain atoms and electrons. The amount and spacing of these electrons and atoms determines physical and electrical characteristics of matter. For instance, wood and iron look and behave the way that they do because of the number and arrangement of their electrons and atoms. In some materials the electrons are very loosely held to the atom. When a voltage is impressed across such material the electrical pressure causes a large number of electrons to flow in the electrical circuit. These are called "free electrons" and are the ones which originally were furthest re-

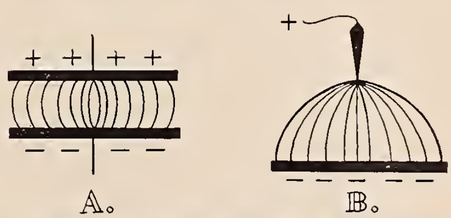


FIGURE 6. *A illustrates the distribution of charges on a parallel plate condenser, and B shows the heavy concentration of charges at a sharp point.*

During the past ten years we have heard that television was "just around the corner." Thanks to tireless research and enormous expenditures of money television has finally turned the corner and is now providing many hours of entertainment to set owners located within a forty mile radius of New York City.

Due to an accelerated wartime research program in the field of electronics, we expect to see many revolutionary changes in the near future in electrical picture transmission. Many engineers have proposed that the number of scanning lines per frame be increased from the present 525 line to some value in the vicinity of 1,000 lines. These newly proposed television standards would result in a picture of sufficient quality for theatre reproduction. It is our belief that every progressive theatre management will exhibit television entertainment in the form of spot news pick-ups and short subjects, as part of its regular program. This type of entertainment will have to wait until after the war is won and television is once more made available for civilian use.

The projectionist of the future will be expected to know how to adjust and maintain complicated electronic equipment, and may also be called upon for minor repairs. Many projectionists can remember how the addition of sound to motion pictures brought with it problems that found even the most skillful projectionists unprepared. Let us hope that history does not repeat itself in the case of television. A series of articles on basic radio, television and electricity, therefore, seems very much in order at this time.

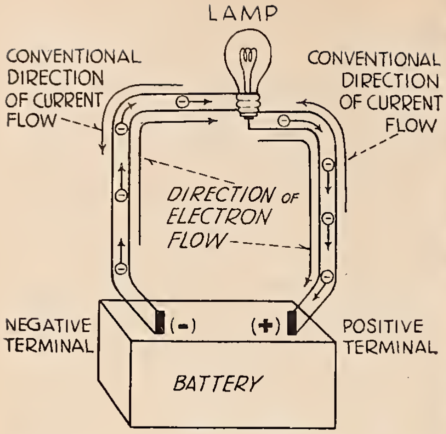


FIGURE 7. ***Diagram showing that electrons flow from minus to plus***

moved from their atoms, that is, the outer electrons shown in Figure 1.

Materials having a large number of these free electrons are called good conductors of electricity. Most metals are good conductors, as also are acid or salt solutions. Materials having practically none of these free electrons are called insulators. Some insulators used in radio are wood, hard rubber, bakelite, glass, ceramics, plastics, silk, cotton, and many other non-metallic materials. Insulators sometimes become conductors when subjected to extreme heat, or to high frequency currents. Some materials are neither good insulators nor good conductors. These materials are called resistors and have many uses in radio circuits.

The correct answers to the following questions will appear in the next issue.

1. **Will a positive charge repel a negative charge?**
2. **Will a negative charge attract another negative charge?**
3. **Will a positive charge attract another positive charge?**
4. **In what direction do electrons flow?**
5. **Do conductors have more free electrons than insulators?**
6. **Do insulators have more electrons than resistors?**
7. **Do resistors have more free electrons than conductors?**

RCA EXPANDS EQUIPMENT SERVICE

The RCA Victor Division of the Radio Corporation of America has announced a broad expansion of equipment service to motion picture exhibitors. A complete line of theatre equipment will be offered exhibitors in the immediate post-war period, it was further stated.

In making known the move Homer B. Snook, sales manager of the company's theatre equipment section, declared that in addition to a full line of RCA sound reproducing systems, Brenkert projectors and RCA screens, the equipment to be offered under the new expanded policy includes nationally known lines of power supply equipment, chairs, carpets and other accessories. Distribution will be handled in the field by RCA's nation-wide organization of independent theatre supply dealers.

"This unified service," Mr. Snook said, "will be provided as soon as possible in the post-war period," and he added that wartime experience in designing equipment for simplicity of operation and dependability of performance will be reflected in peacetime production.

Left to right: Clarence Jalas, L. 110 assistant business manager; James J. Gorman, president, L. 110; George Moore, State Director of the War Finance Committee; Elmer Dowell, Regional Labor Advisor for the Finance Division; Eugene Atkinson, business manager, L. 110, and Harry E. O'Reilly, Midwest Director of the A. F. of L. and Labor Consultant to the War Finance Committee.

$150,000 War Bond Goal of Chicago L. U. 110

THE purchase of $150,000 worth of war bonds with which to underwrite the cost of an Army Hospital Service plane, is the goal set by the Chicago Projectionists' Local No. 110 during the Fifth War Loan Drive. The drive was officially opened on June 19 at the headquarters of the local union with the presentation of a $25,000 check to the U. S. Treasury Department officials as the local's initial war bond purchase.

The purchase of war bonds totaling over $15,000 had been pledged by the membership at a meeting held by the local several days previously, with one member agreeing to buy a $4,000 war bond and several others committing themselves for $1,000 bonds. Despite the fact that the members of Local 110 already are signed up under the payroll savings plan for deductions totaling from ten to twenty per cent of their weekly salaries, the local has undertaken a war bond campaign which will double the bond purchases urged by the treasury department. The outstanding program of Local 110 has been very favorably commented on by treasury officials.

At the successful conclusion of the drive a proper ceremony will be arranged and the hospital service plane will be named in honor of Local 110 members who are now serving in all branches of our armed forces.

Among those present at the ceremonies at the opening of the drive were Harry E. O'Reilly midwest director of the A. F. of L. and Labor Consultant to the War Finance Committee; George Moore, State Director of the War Finance Division, James Gorman, president of Local No. 110, Eugene Atkinson, business manager of the local; Clarence Jalas, assistant business manager, and many members of the local.

BELL & HOWELL OFFERS NEW LENS CLEANING FLUID

Bell & Howell Company, is offering a new lens cleaning fluid, described as being "the answer to the problem of efficiently cleaning surface coated glass." The product is called Opti-kleen, applicable for any lens or finder cleaning. The fluid contains no solids, which eliminates the possibility of residue from the cleaning fluid being left on the surface of the glass.

Projection Room Equipment: Its Care and Maintenance†

THE maintenance and care a sound reproducing equipment receives from the projectionist very often determines the longevity of the equipment. The entire motion picture industry is striving to make the existing equipment and replacement parts last as long as possible. Because the projectionist is responsible for the operation of the sound equipment, he is in a position to be of great help in the conservation of sound equipment parts and the prevention of unnecessary wear in any part of the equipment.

During normal conditions, it has been considered good practice to replace certain mechanical and electrical parts of the equipment before they have been completely used up or worn out. In many cases the parts replaced would have given many more hours of service without reduction in quality of sound, or impairing the mechanical operation of the equipment.

Because of the scarcity of all materials, conservation and the proper maintenance of equipment in the projection room during the present emergency is not only a necessity but a duty which requires a conscientious effort on the part of each projectionist. The intelligent application of a coordinated effort will go a long way toward keeping the sound equipment in all theatres functioning throughout the war period.

All vacuum tubes shall be operated at their specified voltage rating as supplied by the tube manufacturer. While the design of vacuum tubes allows for some variation in voltage and current supplied to the tube, the most satisfactory results are obtained from operation at the normal rated values.

Amplifiers using the larger type power tubes, and if not equipped with a time delay pre-heating relay, require preheating of the filament-element. This type of amplifier is usually provided with a "filament-plate" switch. The tubes should always be allowed to warm up five to eight minutes before closing the plate circuit switch.

The tube contacts should be kept scrupulously clean. This will prevent poor contact which may result in intermittent noise or loss of sound.

A spare phototube should be stored in a cool place. Exceedingly high temperatures may cause the volatile cathode surface to evaporate and the cell to lose its sensitivity. The phototube anode voltage should be maintained within the manufacturer's specified limits. Operating phototubes with the anode voltage above normal may cause the tube to ionize which will result in permanent damage to the tube. Avoid exposure to direct sunlight or projection arc as this may decrease the phototube sensitivity.

If the equipment uses mercury vapor tubes, keep them in an upright position at all times after they have had their initial pre-heating. If possible, keep all spare tubes in their original packing cartons to prevent breakage.

If a tube has to be removed from some part of the equipment, do not discard it immediately. Let the service engineer make a thorough test to determine if the tube should be discarded or if it can be used in some other part of the equipment. Very often a certain tube can be used in one place where it cannot be used in another.

Exciter Lamp Care

All spare exciter lamps should be stored in the spare parts cabinet. Exciter lamps should not be dropped as the filament may be damaged or bent out of position. Avoid too much tension on the lamp base, if used with a screw tightening exciter lamp holder, as it may crack the glass envelope. After the service engineer has determined the proper exciter lamp voltage setting, it should not be changed unless some emergency expedient requires this to be done. It is extremely important not to operate the lamps at a voltage higher than rated as the useful life is greatly decreased.

The mechanical parts comprising the soundhead are machined to very close tolerances because of the delicate and precise function they must perform. Improper adjustment, lack of oil, improper lubrication and lack of proper maintenance all have a tendency to decrease the life of each moving part. All moving mechanical parts and bearings should be properly adjusted and lubricated. Excess oil should be wiped off after each lubrication.

Motor generator brushes should not be discarded unless they are so short that they do not make contact properly with the commutator segments. Contrary to general belief, brushes do not necessarily have to be replaced when half worn down. As a matter of fact, the resistance of the brush decreases as they wear down with consequent lowering of voltage drop across the brush and less heating of the brush itself.

All soundheads should be kept clean and free from oil. If necessary, small absorbent pads should be placed above the optical unit to soak up any excess oil. Most soundhead optical units are sent in for repairs because the lens barrel is partially filled with oil.

The soundheads should be wiped out periodically using a cloth saturated with carbon tetrachloride or similar solvent. The lens elements may be cleaned with lens tissue and extreme care should be taken to avoid scratching the lens surface.

Projectors or soundheads should not be allowed to operate with excessive vibrations. When a machine vibrates excessively, it is a sure indication that some component part is not functioning properly. Unwanted projection room noise and poor screen results will be gradually increased if causes for vibrations are not located and corrected. Vibrations in one part of the assembled projector can lead to serious troubles in other parts until the machine will eventually break down.

One of the most common causes of vibrations in the projector is a poorly adjusted or worn intermittent movement. This condition is readily recognized by the projectionist and should be corrected at once, even though the picture may be steady on the screen.

1. Keep your projection room and equipment clean. Dirt causes wear and tear.

2. Lubricate properly all equipment. Follow the manufacturer's instructions.

3. Make only necessary replacements to conserve spare parts.

4. Burn carbons at minimum current specified by manufacturer. Use carbon savers where available.

5. Clean lenses of optical systems with soft tissue and protect condensers and reflectors.

6. Service regularly all electric current distribution points, such as: motors, generators, bus bars, fuses, switches, resistors and condensers.

7. Allow sufficient warming up period for all vacuum tubes. Burn tubes at specified ratings of equipment manufacturers.

8. Inspect, thread and rewind film very carefully. Keep it clean.

9. Handle reels and film containers with care; these cannot be replaced.

10. DO NOT THROW ANYTHING AWAY.

† RCA Photophone Handbook for Projectionists, Third Edition.

Another is end-play in the shutter shafts. These high speed shafts can vibrate to such an extent that screws and nuts can be loosened in the entire projector mechanism.

Drive motors should be aligned perfectly and projector and soundhead should be carefully checked to assure perfect gear-mesh between the driver and driven gears. Film magazines, change-overs and takeup units should be attached firmly to the projector. Floor bases should be properly leveled on a firm floor. No solid conduit should be attached to the base proper for any purpose. Angle section of base should always be locked solidly in position once projection angle is established.

Inspection Schedules

A careful inspection should be scheduled at least once each month. During this inspection every part of the projector should be cleaned and checked for any indication of wear. Sufficient time should be allotted for this work so that there will be no tendency to pass up any part of the machine.

If the projector is of the type equipped with automatic lubrication, it will not be necessary to give detailed attention to the gear or "non-operating" side because it can be assumed that all working parts installed in this compartment will be free from dirt, so with lubrication being assured. minimum wear can be expected. All attention on this type should be given to the film or "operating" side of the projector.

Upper and lower film sprockets should be cleaned thoroughly with a stiff brush and cleaning fluid by brushing crosswise to the sprocket teeth; this will remove the emulsion which tends to pack at the base of the teeth. If this packing builds up, it can cause picture "jump" even though the intermittent is in correct adjustment, so the same procedure should be used on the intermittent sprocket.

The film trap and tension gate should be removed, and all film shoes should be checked for wear. If noticeable grooving is found. shoes should be reversed if projector design permits. If not, shoes should be removed and grooves polished out on a flat, fine emery stone. The film aperture track should be cleaned while these shoes are removed.

Tension pads should be removed from the film tension gate. Grooves should be corrected same as suggested for trap shoes. Spring tension should be checked to see that all springs are exerting an even pressure. Running with too much tension on film gate pads causes excessive wear on these pads, as well as on the trap shoes and intermittent sprocket. Film sprocket hole mutilation can also result from the improper adjustment of this tension. Film tension should be adjusted to the least amount possible consistent with steady projection. Spring tension should be loosened with film running until a slight jump is noticed on the screen, then carefully tightened until picture is steady.

Reversing Film Sprockets

All film sprockets can and should be reversed for purposes of conservation. While this is not an accepted practice in normal times, it is well for the projectionist to decide to do this as a precautionary measure in case new sprockets are not readily obtainable.

The lateral guide roller assembly which guides the film after leaving the upper sprocket and before it reaches the intermittent sprocket is a most critical part of the projector. Upon the accuracy of this unit depends the amount of "side sway" which will be introduced into the projected picture. These rollers should be kept free and should be continually turning when projecting, otherwise they will become grooved and useless.

The pad-rollers which hold the film in position on the upper feed and lower holdback sprockets should turn freely when projecting, otherwise film damage will result. These pad-rollers must be spaced at the correct distance from sprockets when in closed position. This distance can be established at .015 inch, or two thicknesses of standard film. These rollers should not be allowed to "ride" the film as sprocket hole damage will surely result. These rollers should be lubricated once each week. One drop of projector oil to each roller is sufficient. Excess lubricant should be wiped off face of rollers after lubricating.

New or special processed prints will sometimes leave deposits on the film tracks, sprockets. lateral guide rollers and tension gate to such an extent that the projector must be cleaned almost each time a reel is run through. This condition is not often encountered and most projectionists are familiar with the precautions necessary. If cleaning is not done between the running of such reels, the intermittent will load and cause excessive noise.

The housing guards of rear shutters should be removed often and the shutter blades and hubs should be thoroughly cleaned. otherwise dust and grit will collect on these parts and be blown through the film aperture to the film when running. This often causes the mysterious "scratching" of first run prints, the reason for which often defies detection.

The fire valve rollers, both at the top of the projector and at the entrance to the lower film magazine, should be carefully cleaned often to prevent sticking. During operation of the projector, these rollers should be checked to make sure all are turning. If these rollers stick they will be worn flat in spots; this will cause excessive chattering noise and film damage. Unless the rollers are turning at all times, the fire preventing function will be nullified.

Projectors that do not have the automatic lubrication feature present a more difficult problem in cleaning and servicing. At regular intervals the unit gear assemblies should be removed and gear teeth and shafts should be thoroughly cleaned with a stiff brush and kerosene. All bearings should be cleaned with kerosene using a suitable retort brush. A pipe cleaner can be used to clean the oil holes which lead to these bearings. If this is not done, dirt and grit will collect at these points and each time the projector is oiled, some particles will be carried into the bearings, causing excessive wear on bearings and shafts. A strict schedule for this procedure will result in a smoother running, longer lasting projector. Care should be used when reassembling. Slight "end play" should always be allowed in gear shafts when reassembling to avoid "bind-up". This end play should be about .003 inches.

Lubricant as recommended by the projector manufacturer or a tested equal should always be used for projectors. Inferior oils of the wrong viscosity will impair mechanism performance and cause "bind-ups" with the resultant expense. A careful study of the projector manufacturers' operating manual should be made to familiarize the projectionist with the methods advised for maintenance. When in doubt seek advice from a reputable service organization or dealer.

Carbon Guides

Carbon guides are a necessity when using the suprex type carbons which are most commonly used in all the theatres at present. Under normal operating conditions these guides would last for the entire life of the lamp, yet a surprising number of replacements are made on these items. The metal used for these guides is one of the critical metals for defense, being of high heat resisting quality. This metal is hard to obtain and is very expensive.

It has been found that the most common cause of damaging these guides is where the projectionist gets caught with a short carbon trim, and in order to hold the show on the screen and "waitout" the change-over, feeds the carbons by hand. This gets the arc out of position and too close to the guides which causes fusing and distortion. This makes it necessary to replace the guides because the carbons will not line up properly with the optical center of the projector once the guides have been distorted. Unless the carbon guides are properly set and kept absolutely free of pits or burnt spots, the

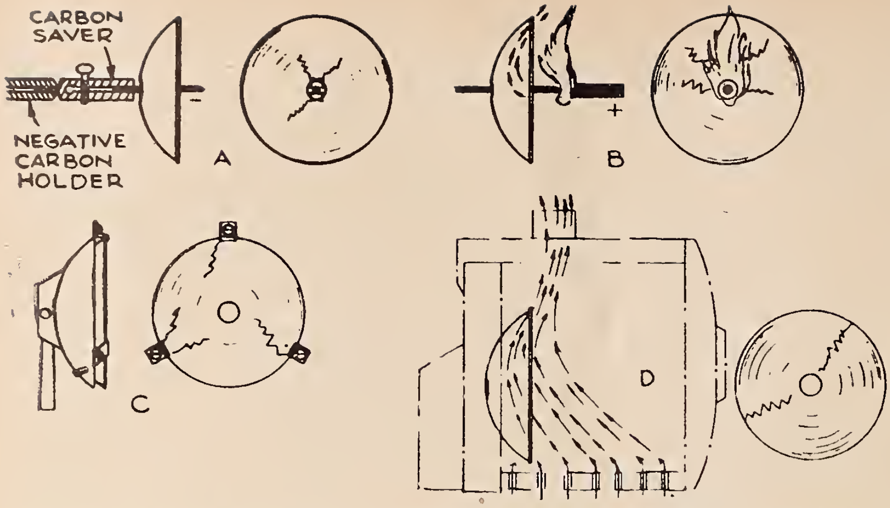


FIGURE 1. FOUR COMMON CAUSES OF ARC REFLECTOR BREAKAGE

(A) *Poorly designed carbon savers*
(B) *Arc Current Excessive*
(C) *Reflector holder clamps too tight*
(D) *Excess draft through draft pipe on opening door of lamphouse too soon after shutdown.*

suprex type arc lamp will not function within 25 per cent of its normal efficiency. Great care should be exercised to prevent burning these parts.

The most common cause of arc lamp inefficiency can be traced to improper arc supply source. Whether motor generators or rectifiers are used for this purpose they should conform to the lamp manufacturer's exact specifications as well as that of the carbon manufacturer.

A projection arc lamp which is specified for one application should never be operated above that particular current rating. If an attempt is made to convert or adapt such lamp for use with a higher arc amperage, poor operation can be expected. For example, a low intensity type lamp designed to operate properly at 30 amperes will not dissipate the heat created at 40 or 45 amperes. Results will be warped doors, broken reflectors, broken sight glass and unsteady arc control operation which combines to make the final efficiency much less than if the change had never been attempted. In addition to these faults there is the excessive waste of carbons and current without the sought-after increase in screen light. Arc lamps should always be operated within their specified limits for top efficiency.

Proper Handling of Reflectors

The reflector is the most delicate and important single item used in the modern projection arc lamp. Special attention must be given the reflector in order to keep it operating efficiently for the longest period of time.

The reflector should not be handled when hot. The chances of accidental breakage are far too great. Besides, if the reflective surface is touched with the fingers when hot, the fingerprints will be practically etched into the glass to the extent that they cannot be removed. An oily cloth will produce cloudiness no matter how small the amount of oil on the cloth. New cheesecloth should be kept on hand for cleaning the reflector. Castile soap and clean water is the best cleaning agent. If the reflector is not systematically cleaned, it will rapidly lose its efficiency.

A habit should be formed of cleaning the reflector every operating day. If a wooden salad bowl can be obtained which is a bit larger in diameter than the reflector, it will be found that this vessel will be ideal for positioning the reflector while cleaning. Cleaning will lessen the effect of "pitting" which is inherent in suprex type carbons. After cleaning the reflector it should be carefully dried before replacing in lamphouse. Otherwise a crack may result.

Care must be exercised in the amount of exhaust draft used to carry off the carbon gas and fumes. Excessive draft will break reflectors. Also, unsteady arc burning will result from this cause. The lamphouse doors should always be kept closed for a short time after each changeover.

The reflector must have ample room in the reflector holder when installing. After reflector is properly mounted there should be about 3/32" play from side to side, otherwise the reflector will crack under the stress of heat expansion.

Carbon-savers of certain designs are very dangerous to reflectors because the metal clamps on these savers do not always have sufficient clearance through the center hole in the reflector. If the slightest negative carbon adjustment is made during operation, the metal clamp may be fed up on the glass, breaking the reflector. If the metal in the saver only touches the inside of the center hole without stress, breakage can result from the high heat which is conducted by this metal. It is false economy to break reflectors with poorly designed carbon-savers.

Excessive arc current will surely break or destroy the efficiency of reflectors. Arc lamps should not be operated at the extreme limits if it is wished to conserve on parts and have trouble-free operation. An arc lamp reflector can be ruined in an attempt to obtain more light than the design will allow. See Figure 1.

Higher amperage by no means assures more screen light; the reverse is more often the case as excessive "tailflame" shadows a large portion of the reflector surface as well as distorting the crater or gas ball which produces the useful light. It is good, sound practice to operate the arc lamp at an amperage below the specified limit.

Arc Control Unit

Consistent operation of the modern reflector arc lamp depends largely upon the proper functioning of the arc control unit. Arc control units generally consist of a motor, contactor relay, or potentiometer combined with mechanical adjustments to position and maintain the arc gap in proper relation to the reflector and projector film aperture. These units operate on the change of voltage across the arc as the carbons are consumed. This voltage being low, it is necessary to have very accurate electrical as well as mechanical adjustments in order to feed the carbons uniformly.

The following suggestions should keep the arc control operating at its highest efficiency:

The motor used on the average control is a d.c. 1/30 or 1/50 h.p. wound to operate at the prescribed arc voltage of the particular application. The motor should be inspected monthly. The brushes should be removed and examined. The commutator should be checked for roughness. 2/0 sandpaper can be used to keep the commutator surface smooth and bright. Arc control motor bearings must not be over lubricated. One drop of oil twice a week at each bearing is sufficient. Packed ball bearings need attention only about once every two years.

Manufacturers' specified brushes should be used for replacement, otherwise poor motor operation may result from "sticky" brushes or brushes of the wrong carbon stock.

The motor should be kept clean. A few minutes a day spent in cleaning this item will repay the effort by faultless

operation. Contacts, relays and potentiometers should be regularly inspected. These parts should be checked for loose connections, "pitted" points or poor contact surface. Crocus cloth or a fine Swiss file should be used for polishing contact points.

Relay contact points should be kept properly adjusted as recommended by lamp manufacturer. About .005 of an inch is generally correct for this spacing.

Carbons are fed to maintain the correct arc gap by the action of the arc control unit which is geared to the feed screw of the positive and negative carbon holders. Care must be exercised to keep carbon ash and dirt away from the feed screw and guide rods, otherwise binding of the mechanism may result. This binding will load the arc control unit causing erratic carbon feeding and poor screen light.

Careful inspection will always locate the source of troubles. These troubles can generally be corrected without the use of special tools and with little effort once they are isolated.

The lamp mechanism must be kept properly lubricated. Excessive oil should not be applied to any part. Projector oil is recommended on all parts except where extreme heating conditions exist. Special lubricants are specified by manufacturer for these points where heat is a factor. If the lamp is of the type using gear boxes, these boxes should be kept packed with the proper grease.

The lamphouse should be kept clean on the inside. Carbon stubs or molten copper pellets must not be allowed to lie under the feed screw or guide rods. This practice will lead to poor operation. The ash should be removed from the lamphouse draft pipes every 90 days. This will assure an even exhaust which will result in a more even burning arc, also preventing the ash from falling into the lamp mechanisms.

Arc Supply Rectifiers

The a.c. power supply circuit to arc supply rectifier should always be broken when shutting off or changing over these units. The output or d.c. switch should never be used for this purpose, as this sudden unloading builds up abnormal current surges in the transformer windings and may break down the insulation of the coils or shorten the life of tubes.

Rectifiers should always be installed so that the a.c. power supply line can be broken at the lamphouse location. Many rectifiers have remote contactors which can be operated from an ordinary toggle switch of 15 ampere rating. In smaller units it is necessary to break the a.c. power supply through the knife switch on the lamphouse pedestal base.

If the present installation of rectifiers is located any distance above fifty feet from the projection room, and if there is available space, and a.c. power facilities near this space, it would be well to rewire the rectifiers at this new location. By shortening the output conductors much better operation will result, as well as a slight saving in current cost.

To conserve gas tube type rectifiers they must be operated well within their specified rating. Proper carbon combinations must be used for the arc current as specified by the carbon manufacturer. Tubes should be kept evenly balanced.

A new tube should never be used in combination with a very old tube as this will result in an unbalanced load and will cause erratic operation of the complete unit. Tube base contacts must be kept bright and clean; 2/0 sandpaper can be used to polish both center contact and shell of tube. The tube sockets must be kept equally clean and tubes must be screwed down firmly in these sockets at all times. All connections on terminal panel must be kept tight. Anode (or plate) clip connectors must have good spring tension, also clips and tube contact post must be kept clean and bright.

Rectifiers must be kept clean and well ventilated. The a.c. power supply voltage must be kept constant. As an example: If the line voltage from the power company reads 230 volts when using a good a.c. voltmeter, it will be necessary to tap the primary of the transformer as near 230 volts as possible for correct results in the output or d.c. circuit. Provision is made on all rectifiers for adjustment within a limited range for line voltage. If the voltage is lower or higher than the limits shown on rectifier adjusting panel, the power company should be consulted for correction, otherwise serious damage may result. It is very necessary that a constant primary voltage be maintained for rectifier operation. Any fluctuation over 3 per cent will affect efficient operation of these units. Solid conduit should not be installed so that it is attached to the rectifier housing as this will induce vibrations in the housing with resultant noise.

Copper Oxide Rectifiers

These rectifiers are highly efficient and require little attention on the part of the projectionist with the exception that the units should be cleaned occasionally, using a small hand "bellows" to blow out accumulated dust, and the cooling fan should be lubricated as instructed by the manufacturer. The function of the cooling fan is most important in these rectifiers, since it is used to ventilate the copper oxide elements and the transformer windings. Most rectifiers of this type are so designed that the 110 volt a.c. circuit which operates the fan also actuates a magnetic relay to close the three-phase power supply. This is to prevent the possibility of operating the rectifiers without the cooling fan should this unit become inoperative.

These units must be installed in a dry, well-ventilated location for optimum efficiency. They should never be installed in a damp cellar, nor under stairways, nor where mopping with water will contact the case or wet the floor near these units. Rectifiers should be installed as near the projection room as possible to limit line losses in the output. Forty feet is considered maximum efficient distance. The output conductors to the arc lamps should be of proper size for the arc current to be used.

The rectifier location should be kept

(*Continued on page* 26)

A Few Wartime Suggestions

By *L. P. WORK*
PROJECTION DEPARTMENT, JAM HANDY, INC.

MOST dentists have on hand used probes and similar tools which may be had for the asking. When properly ground and shaped, they make excellent center punches, scribers, etc. The type which has a reverse curve point is especially useful in exploring for hooked claw teeth on 16-mm, and undercut teeth on 35-mm machines.

A few inches of old street car trolley wire makes a very good tip for a 100-watt soldering iron—it holds tinning much better than the usual type. Make a habit of removing the soldering iron tip occasionally and scrape off the oxide, otherwise it may "freeze" and you will risk ruining the iron in drilling out the old tip.

Good files are becoming scarcer every day, therefore don't use a steel brush cleaner, but use an old tooth brush for loose accumulations and a brass file card for dislodging solder, etc. Such a file card can be made by bending a soft brass strap to an L shape and stroking the short end transversely across the file, parallel with the file cut.

When rosin core solder is not at hand, solid wire solder, or bar solder, may be used with a flux made of powdered rosin dissolved in rubbing alcohol.

Most friction tape obtainable these days is of poor mechanical quality. For dressing terminals and for general application in close quarters, one-half inch adhesive tape will be found very satisfactory.

Prolong the life of your appliance cords by *folding* instead of wrapping them around your solder iron, work lamp, and similar projection room tools.

IN THE SPOTLIGHT

By HARRY SHERMAN

IT IS not our policy to crow every time a bouquet, no matter how well-earned, is thrown our way, but when Duncan B. MacKenzie, secretary of Local No. 302, Calgary, Alta., Canada, told us at the recent I. A. Convention that we were an important factor in the successful fight for two-man operation in motion picture theatres in the Province of Alberta, we felt a deep glow of satisfaction. According to MacKenzie, our reply to his request for certain information "turned the trick," and the following amendments regarding the regulations governing motion picture projectionists in Alberta have become effective as of May 9, 1944:

(1) In any theatre or place of amusement in the Cities of Edmonton, Calgary, Medicine Hat, and Lethbridge, where motion pictures are exhibited and where there is more than one motion picture machine used, there shall be on duty at all times during public performances two licensed projectionists as follows:

(a) Where the seating capacity exceeds 500 there shall be employed two projectionists holding first-class licenses; and

(b) Where the seating capacity does not exceed 500, one projectionist shall be employed who is the holder of at least a first-class projectionist's license, and an assistant who is the holder of at least a third-class projectionist's license.

(2) In any theatre or place of amusement situated elsewhere in the Province where motion pictures are exhibited and where there is more than one motion picture machine used, there shall be on duty at all times during public performances one licensed projectionist who is at least the holder of a third-class projectionist's license.

Provided, however, that the Chief Inspector of Theatres may, by notice in writing, prohibit operation unless there are two licensed projectionists in the projection room in the case of any theatre or place of amusement where the Chief Inspector of Theatres is satisfied that otherwise the safety of the public may be endangered.

● There has been a lot of hullabaloo in the recent trade press regarding the mutilation of film. Severe criticism was levelled at projectionists, exchange workers, and what have you. Some of this criticism is justified and some of it, in our opinion, is just pure bunk. However, if the producers and film exchange managers are really sincere in their efforts to prevent the unnecessary mutilation of many thousand feet of film each year, they might find it worth their while to investigate a clever little gadget invented by Tom Kulka, member of Local No. 160, Cleveland, Ohio. It is Kulka's contention that a large percentage of damaged film is due to careless handling in transportation, and he has perfected a reel band guaranteed to reduce this problem to a minimum. This reel band has met with the enthusiastic approval of all who have seen it.

MEMBERS OF LOCAL NO. 347, COLUMBIA, S. C., GET TOGETHER AT OPENING OF NEW MEETING HALL AND CLUBROOM. ***Standing, left to right: James S. Wilson, G. L. Turner (treasurer), Lewis Waddell, Fred Wackym, H. L. Dobson, C. L. Cromer (business representative), A. H. Estes, F. L. Boland (vice-president), L. M. Davenport, B. H. Truesdale, J. A. Motte (sergeant-at-arms), Jim Crawford and C. L. Addy. Seated, left to right: George Blackburn (secretary), W. H. Herring (president), and W. L. Dent (financial secretary).***

● We are deeply appreciative of the resolution unanimously passed by the delegates from the 10th District (State of New York) at the recent St. Louis Convention, in which it was decided to subscribe to I. P. for all its members now serving with the armed forces. The district secretary, H. Paul Shay, immediately sent a letter to all local unions in the 10th District, requesting that they furnish him with the names and mailing addresses of all their members now in service, so that the magazine would be sent to them without undue delay. These gift subscriptions are to be paid for by the 10th District treasury and not by the individual locals.

● Don Ackard, veteran projectionist chief at the Harris Theatre in Pittsburgh, Penna., and a member of Local No. 171, died while on vacation in Florida.

● Thad Barrows, president of Local No. 182, Boston, Mass., is a baseball fan and an ardent admirer of the Red Sox team. Joe Cronin, manager of the team, is a personal friend of Thad's, as are many of the players. When the Red Sox lose a game Thad shows his sorrow by dimming the lights in the projection room of the Metropolitan Theatre. Methinks there will be many a dim light before the season is over. Wanna bet?

● The Fire Prevention Bureau of a certain city bogged down on a theatre owner who was fined $20 for cluttering up the alley *outside* the theatre. But this same bureau overlooks the many violations in the theatre projection room where they probably have one-man operation, no running water or toilet facilities,

and poor, if any, ventilation, to mention a few of the common violations. Maybe the health and safety of projectionists don't count with certain people.

● The following impressions of a newcomer to I. A. conventions was submitted by one of our readers, G. R. Demery, member of Local No. 173, Toronto, Canada. Although Demery has been a member of the Toronto local since 1911, the St. Louis convention was the first he ever attended and his observations are pointed and not without humor:

St. Louis—nice town, excellent department stores, hotels all of high order, beautiful and spacious parks, fine public buildings and upper suburban districts are a treat for the eyes. The zoo is the cleanest and best laid out of any I have seen, but not quite as complete in specimens as those seen in Philadelphia. Visited the Ambassador, Loew's, and Schubert Theatres — projection and sound excellent. A salute to the women of St. Louis—above the average in looks and dress, and especially in deportment. Guess that's why some of the wolves didn't do so well. Had occasion to visit City Hall on business and was taken in charge of J. Gallagher, deputy registrar, and his assistant. I was givn courteous and effecient attention, along with a pleasant chat. The Spirit of St. Louis certainly prevails there. What I didn't like about St. Louis—the buses. They murder you with their gas fumes, so much so that drug stores advertise a remedy to rvive you—must be a tie-up there.

The convention was well staged amid impressive settings, but not overdone. Proceedings were dignified and business moved on smoothly. Liked the way Walsh conducted the sessions—appeared to have the workings of the Alliance at his finger tips at all times.

Special treat—a chat with the gracious Louise Wright, new member of the official family. Good luck to her.

St. Louis Locals 6 and 143 had everything under control for the delegates, except the taxi prices on opera night.

This Gelber of Local No. 306, New York City, seems like a live wire. Must be tough for an exhibitor to convince him.

Bright spot—the clean cut type and likeable manner of the men from the studios of Hollywood. Good union material in them thar Hollywood hills, mister.

Rabbi Thurman and Father Growney were easily the highlights of the convention, each one masterly in his own way.

Missed out on Barrows and his Irishmen from Boston (and me partial to the Irish). However, I heard their famous election story.

Boys from Local 306, New York, apparently didn't come to listen but to be heard, and we heard *plenty*.

The open house rooms around the Jefferson got quite a play, but when the bunch from Texas blew in, there was a riot. And they tell me the dice from Texas do everything but talk. The losers did plenty of that.

Didn't know Bob Burns had a double until I saw and heard R. T. Wood from the Ozarks.

The Canucks didn't say much, but I don't think they missed anything. And did they like "Oh, Canada," when they heard it opening day! Me, too.

Some of the floor men and their issues smacked of the early days, but they meant well. Must have been stagehands.

Liked the act that traffic cop put on at 12th and Locust. He could have made the Palace in the old days.

Krouse was here, there and everywhere, tending the delegates' needs. Shows plenty of action.

Covert did the pinch-hitting for Walsh and batted like a 300 hitter.

Bill Elliott of Cincy looked big and peaceful up there on the rostrum.

Even the Browns caught the convention spirit, for they took the lead in the American League while we were there. Now all they have to do is stay there and meet the Cards in October.

Administration won a neat victory but had to go all out. Good luck to them. They will need it this next two years. To the losers would say, give your board your whole-hearted support and back them with the spirit of the Allies—one for all and all for one.

And last but not least, with the exception of the guest speakers previously mentioned, the best speaker on the floor, for my money, was Harry Sherman. (*Is our face red—* H. S.)

● The Associated Electronic Engineers, an organization of sound service men employed by RCA and Altec, has made rapid strides during its short existence. According to latest reports, its membership is affiliattd with 83 I. A. local unions in 36 states and the list is steadily growing.

● Here we have a likeness of our very good friend, Gene Atkinson, business agent of Local No. 110, Chicago, Ill., greeting William Green, president of the A. F. of L., upon his arrival in St. Louis to attend the I. A. convention. I. A. President Walsh appointed Gene to meet President Green at the train and to escort him to and from the convention hall. In the background can be seen the smiling countenance of George W. Brayfield, I. A. trustee.

Gene Atkinson, business manager of Local No. 110, Chicago, greets William F. Green, president of the A. F. of L., at the recent I. A. Convention. In the center, George Brayfield, I. A. trustee, beams his approval.

● The progressive members of District No. 1 (which takes in the states of Oregon, Washington, Idaho, Montana and British Columbia), under the able leadership of district secretary and I. A. representative Orin M. Jacobsen, enacted worth-while legislation in St. Louis. At the district meeting, it was proposed to increase the death benefit plan from $300 to $500, and this proposal was referred to the individual locals for a referendum vote. Plans were discussed relative to the postwar period, and each local was urged to inaugurate an educational program for its members. The allowance for convention delegates was increased from $12 to $15 per diem, in keeping with the present-day higher living costs. We might mention here that they bring out a Quarterly Bulletin which is of inestimable value to its members.

● We understand that Sam Reider and Frank Pilleggi, projectionist members of Local No. 384, Hudson County, N. J., run a chicke farm as a side line. We should like to express an opinion on the abilities of Brothers Reider and Pilleggi as chicken farmers, but we shall have to let that wait until we have had the pleasure of sampling their wares.

● The new Radio City Theatre in Minneapolis, Minn., is said to be the largest motion picture theatre in the United States west of Chicago. Chief projectionist Fred Berglund, Frank Rogers, Horace Evans, Jere Miller and Pat McMurchie, all members of Local No. 219. make up the projection crew.

● Ralph Stearns, member of Local No. 195, Manchester, N. H., is stationed at Scott Field, Mo., as camp projectionist. He paid a surprise visit last month to business agent Arthur Smet, who was a delegate to the I. A. convention in St. Louis.

● Local No. 482, Champaign-Urbana, has successfully concluded new contracts with the Alger Brothers Theatres (Park, Princess and Co-Ed Theatres) calling for a 12½% increase in pay; 10¼-hour work day, and overtime pay for repairs and replacements of equipment. The contracts have been approved by the War Labor Board.

Under the leadership of president P. A. Wills, Local 482 has taken a long step forward in the establishment of prestige and improved working conditions for its membership. Good luck!

● G. H. Payne, business agent of Local No. 538, Westerly, R. I., sent us a newspaper clipping the other day which we found very interesting. According to this clipping, a package containing motion picture film became ignited in the ex-

(*Continued on page* 24)

Captain Harry J. Stone receiving the Distinguished Service Cross from Lieut.-Gen. Mark W. Clark.

Distinguished Service Cross Awarded to Capt. Harry J. Stone, L. U. 160

EVERY projectionist in the country is proud of the record of the craft in the war, with the latest individual to be signally honored being Captain Harry J. Stone, Medical Corps, U. S. Army, who has received the Distinguished Service Cross from Lieut.-Gen Mark W. Clark, commander of the Fifth Army. Captain Stone is a member of Local No. 160, Cleveland, having worked his way through Western Reserve Medical School as a projectionist. His father, Archie Stone, is one of the old time members of the Cleveland local.

Capt. Stone's decoration was awarded for extraordinary heroism in action near Anzio, Italy, where on January 27 last he advanced with a company attacking in daylight across an exposed field. He kept pace with the foremost elements and following the assault maintained an aid station under direct enemy observation. His prompt treatment under fire was a vital necessity, the citation sets forth, "since evacuation was impossible because of direct enemy observation and nearness of enemy positions."

During succeeding days, Capt. Stone further distinguished himself, saving many lives. "With no regard for his own safety," the citation continued, "he promptly treated and evacuated all casualties. His calm demeanor and sustained courage and skill under fire were an inspiration to all officers and men, and his performance reflects the finest traditions of the Medical Corps."

NATIONAL CARBON ANNOUNCES NEW SALES SETUP

The National Carbon Company has announced a new sales setup under which all company products will be handled nationally from seven divisional offices. Four of these offices now are in operation and others will be added by October first.

It is pointed out that all sales activities in the southeast have been consolidated under a new Atlanta Division office. This division will comprise, in addition to Georgia, the states of Virginia, North and South Carolina, Alabama, most of Tennessee and Florida. J. F. Warnell, former manager under the "district" system and recently stationed at New York, has returned to Atlanta as division manager. He is assisted by C. J. Chapman, who has been in company sales for the last ten years, and W. R. Peppard, office supervisor. Headquarters are located at 41 Marietta Street, Atlanta 3, Ga.

The new Dallas, Texas, division is managed by C. C. Joslyn, who has been with the company for more than a decade. J. L. Mullin is assistant manager and J. F. Uhl is the office supervisor. This division, with headquarters at 200 South Ervay Street, comprises in addition to the state of Texas, the states of Arkansas, Oklahoma, New Mexico, Mississippi, Louisiana, and part of Tennessee.

At Kansas City, A. C. Bryan, associated with the company for ten years as salesman and sales executive, has taken over as division manager, with E. L. Dibble as his assistant. C. H. Wade is supervisor of the new offices at 19th and Campbell Streets. In addition to Missouri, this division comprises the states of Kansas, South Dakota, Wyoming, Nebraska, Colorado, Western Illinois, and most of Iowa.

On the west coast, R. P. Tolles directs the new San Francisco organization. Assisting him are A. R. Miller and O. B. Rendahl. The office is located at 114 Sansome Street, and from here will be directed sales in California, Washington, Oregon, Western Montana, Idaho, Utah, Arizona, and Nevada.

Three other division offices will be opened in Chicago, Pittsburgh and New York. Enlarged staffs will be active in all the divisional headquarters, with the personnel made up of specialists and salesmen of long experience in all National Carbon lines. While the new system gives the divisional heads responsibility for sales of all company products, customers for carbon products, electrodes and anodes, will be served by men who give their whole time to those lines.

RCA WILL DISTRIBUTE THEATRE EQUIPMENT ABROAD

The International Department of the RCA Victor Division of the Radio Corporation of America reveals that a complete line of motion picture theatre equipment will be made available through RCA to exhibitors in countries outside the United States. This is in line with its recently announced policy of expanded theatre equipment service in the domestic field, it is announced.

J. M. Knauth, International Manager of Theatre Equipment Sales for RCA, explained that "exhibitors in foreign fields who for years have been having good experience with RCA sound systems have repeatedly expressed a desire that we handle other major items of theatre equipment, as well as the smaller accessories. The augmented line now projected will provide this unified equipment service for anticipated post-war theatre expansion in foreign countries."

He also pointed out that interest in motion pictures is on a continuous upgrade in the international field. "Local film production," he added, "is expanding. American producers are lining up more and more services to markets abroad. The theatre after the war will play a greater role than ever in community life."

TRAINING COURSE FEATURES MOTION PICTURES

Charles R. Crakes, director and advisory administrator of visual education for the public schools of Moline, Ill., for the past 20 years and at present affiliated with the DeVry Corporation as educational consultant, is now conducting a course on "Visual Training Aids in the Classroom" at Northwestern University's School of Education, at Evanston, Ill. This course is designed for school administrators, supervisors and teachers interested in the efficient use of projected training aids, such as motion pictures. Mr. Crakes has spent a quarter of a century in the educational field and has had a wealth of practical experience in the use of motion picture and sound equipment.


Out of this fund of knowledge
MOTIOGRAPH'S ENGINEERING STAFF
M
THE WORLD'S OUTSTANDING INDUSTRIAL DESIGNERS
SUPPLY DEALERS' EXPERIENCE IN PROJECTION PRACTICE
OUTSIDE CONSULTING ENGINEERS
AMERICA'S MOST TALENTED PROJECTIONISTS
will come that great new post-war
MOTIOGRAPH PROJECTOR

TELEVISION TODAY

X.—Reproducers

By *JAMES FRANK, JR.*

PART II

Supersonic Light Control

One of the devices used for reproducing television images by Scophony is known as the "supersonic light control." This method was used commercially before the war in England for both home and theatre (large screen) receivers with great success. It is also one of the devices through which light is projected, an important factor in its use for large screens.

The supersonic light control makes use of the diffraction or bending of light by a grating consisting of supersonic waves in a liquid. Supersonic waves are those created in a liquid whose frequency, number per second, are in the range between approximately 10,000 and 20,000 cycles per second.

A cell with two opposite transparent walls is filled with a transparent liquid. A piezo-electric quartz crystal, such as is used in microphones and phonograph pick-ups, having a natural frequency in the supersonic range is arranged in such a way that it can transmit its vibrations to the liquid of the cell creating traveling waves therein. When an alternating current of suitable intensity is passed through the crystal it vibrates in direct proportion to the pulsations of the current.

Thus, the video signals, which are properly amplified after being received from the television transmitter are made to pass through the crystal causing it to vibrate and set up supersonic waves in the liquid of the cell which are directly proportional to the video signals. These supersonic waves represent periodic compressions and rarefactions of the liquid, producing similar variations in the refraction index of the liquid which act on light transmitted through the cell like a variety of minute prisms.

An optical system, Figure 51, through which the light is transmitted projects the image of a slot on a bar on the other side of the cell of such a size and position that practically all of the light is stopped when the cell is not active. As soon as supersonic waves are excited in the liquid a certain amount of the light is diffracted, bent, but the diffracted light has a position outside of the intervening bar. Thus, an amount of light can pass this bar to the screen beyond in proportion to the intensity of modulation or variation of the supersonic waves, which is, in turn, proportional to the intensity of the television signal.

A lens placed just beyond the bar which will accommodate the more intense of the diffracted light rays focuses the light on the screen. An image of the wave-train in the supersonic light control is formed on the screen. The supersonic waves carrying the signal modulations in

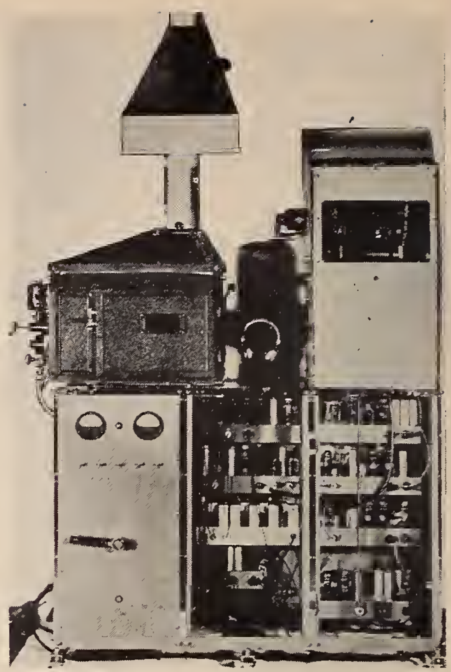


FIGURE 52. *Scophony supersonic television projector giving a picture 20 feet wide*

the liquid travel away from the exciting crystal with a velocity or speed of the order of 3.275 feet per second. This wave-train, for a high definition television picture of present standards, is nearly a full picture line.

To simplify the optical system about one-third to one-half of a line is projected at a time. In this way the supersonic light control projects 200 to 300 picture elements onto the viewing screen simultaneously. In other words, each picture element is actively illuminated for the scanning duration of 200 to 300 elements. An "optical storage" of the picture for this duration corresponding from one-third to one-half of a line is thus effected by the supersonic light control.

The light modulations projected onto the screen would move along the lines with a velocity corresponding to the velocity with which the supersonic waves travel in the cell. However, a mirror polygon, called the "high speed scanner" (Figure 51), having 20 or 30 faces serves to sweep the light beams across the picture screen with a speed exactly opposite to that of the movement of the waves on the screen, and of such a magnitude as to compensate this movement. Thus each element is immobilized or brought to rest on the screen.

Using a 20-mirror polygon, a motor running at 47,250 revolutions per minute is required for reproduction of a 525-line image. Using a 30-mirror polygon high speed scanner, the same result will be obtained at 31,500 rpm. The bearings and balancing of the rotor must be of high quality to achieve service-free operation for a time comparable with the life of standard receiving tubes. The driving

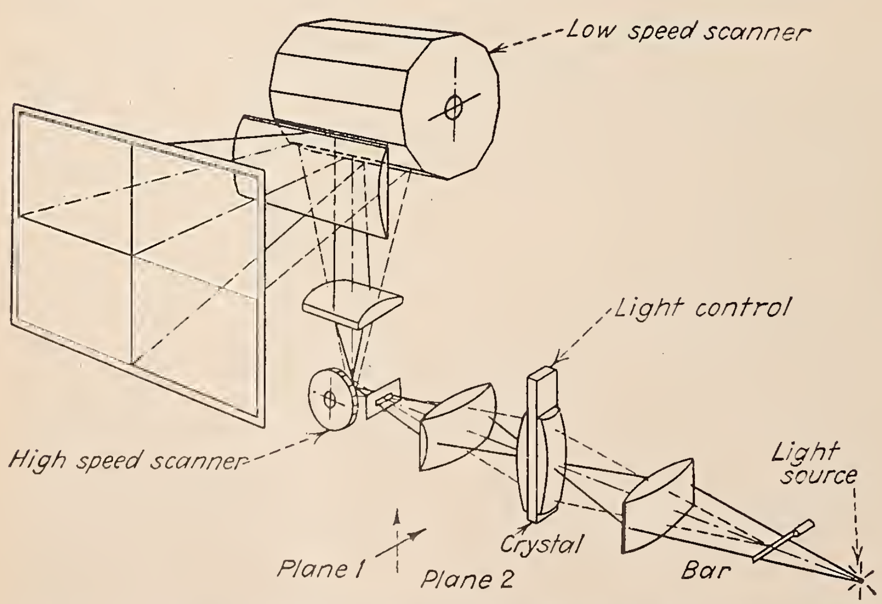


FIGURE 51. *Schematic optical diagram of Scophony receiver for home use, showing arrangement of split focus and light control*

FIGURE 53

mechanism consists of an asynchronous three-phase motor which supplies the power, and on the same shaft a phonic-wheel synchronous motor to the stator of which are fed the synchronizing signals from the receiver.

Frame Scanning Movement

The frame scanning movement, that is, moving the element images vertically down the picture, is achieved through the use of a slow-speed scanner, a 20-mirror polygon driven at 180 rpm by means of a synchronous motor. The alternating current to drive this motor is obtained by amplifying the frame synchronizing pulse transmitted as a part of the video signal by the transmitter.

A television receiver using the supersonic light control for theatres may be seen in Figure 52, and one suitable for schools, churches, clubs and restaurants is shown in Figure 53.

One of the most important characteristics of this method of reproducing television images is the optical storage of the picture elements over a substantial part of the frame period. The retention of the illumination of each element amounts to the simultaneous illumination of a considerable fraction of the total picture area, which results in a proportional increase of the total light energy available for each picture. This coupled with the fact that the light is projected through the control offers great possibilities for large screen images.

The Skiatron

The "skiatron", another device for reproducing television images, is a development of Scophony. In some respects it is similar to the light valve of RCA. The skiatron makes use of the full storage principle.

As shown in Figure 54, the skiatron consists of a cathode-ray tube device in which a crystalline screen is exposed to the modulated and deflected cathode-ray beam. The screen material exhibits the property of "electron opacity", that is, it can be rendered opaque by being scanned by a cathode-ray beam. By subjecting the screen to a suitable electric field and temperature it is possible to cause the opacity to remain constant for substantially the whole frame period and to then disappear quickly when the beam returns to produce the opacity for the following frame.

The crystal screen consists of a material such as sylvine, or rock salt, in micro-crystalline form. The effect of the impact of the cathode-ray on to the crystal is the formation of an opaque deposit which travels in the direction of the electric field through the lattice toward the anode and ultimately disappears there. The total time of travel of the deposit through the crystal, or in other words the persistence of constant opacity at one element, depends upon the strength of the electric field and temperature and certain crystal constants.

With a sylvine crystal one millimeter thick and a potential of 600 volts at its ends, the deposit would move through the crystal, or remain in visible existence, within 1/30 second, equal to the frame period of present television standards. At the same time that the deposit at a certain element enters the anode, thus disappearing, the scanning cathode-ray beam returns to this particular element and creates a new deposit of a value belonging to the following frame, at the cathode side of the crystal. This deposit then starts on its travel through the crystal toward the anode which it reaches at the end of this frame period. Thus it is possible to retain the elemental intensity values constant over the entire frame period, and change them at the end of this period to the value corresponding to the following frame. In this way is full storage television reception achieved.

The skiatron utilizes a projected light source as shown in Figure 54. It can be well used for large screen television images where the principal limitation will be the size light source used and the optical system including the crystal screen. Scophony has carried on a considerable amount of development and experimentation with the skiatron and plans to incorporate it in television receivers in the post-war period.

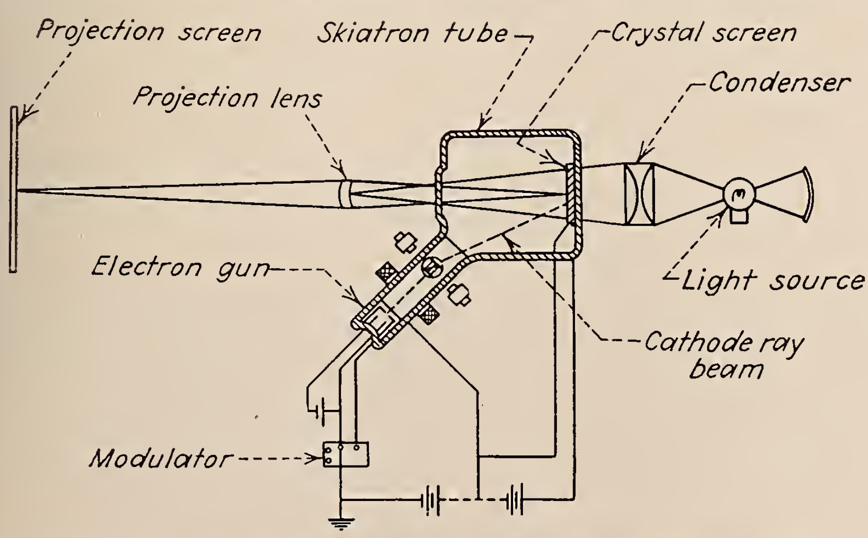


FIGURE 54. *Schematic diagram of the Skiatron and its associated circuits*

NEW MODULATING LIGHT DEVELOPED BY HANOVIA

The research laboratory of the Hanovia Chemical and Manufacturing Co., Newark, N. J., has developed a new modulating light consisting of a high pressure mercury vapor lamp with associated controls. The new light, for which patent application has been filed, is said to provide "a perfectly steady light as a source for printing sound track on film." It also is said that the associated controls "automatically adjust the light intensity to various levels for the printing of photographic films, especially those used in motion pictures."

Lester F. Bird is credited with development of the light. He also developed a new type of mercury arc lamp operating on 85 watts input with specially designed heater coil to permit operation within a wide intensity range of from one to ten. This device replaces incandescent lamps previously used, which are said to be much less efficient in the photoactinic range and produce a hissing sound on film track.

NEW ALTEC AGREEMENTS

Henry B. Moog, southeastern district manager for Altec Service Corporation in Atlanta, Ga., announcs the signing of agreements with the Chickasaw Amusement Company for service, sound R&R and booth R&R for their five theatres in western Tennessee. Moog has also concluded an agreement with the Ruffin Amusement Company for the servicing of six theatres in western Tennessee.

Altec's district manager in Chicago, R. Hilton, reports signing of service agreements with the Bartelstein circuit of theatres located in Cicero and Chicago.

W. E. DECLARES DIVIDEND

Directors of the Western Electric Co. have declared a dividend of 50 cents a share on its common stock, payable June 30 to stock of record at the close of business on June 23.

iP AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

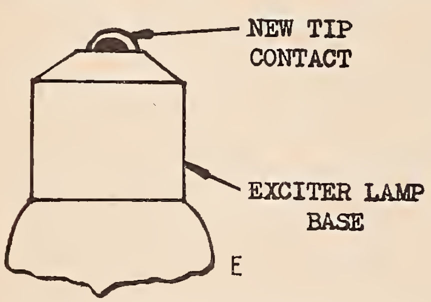
Cleaning Optical Systems

In cleaning the front objective of an optical system, or the rear condenser lens surface, the tiny crevice between the brass mount and the glass surface can be cleaned of accumulated waste by plowing out the dirt with a match stick sharpened to a chisel edge and moistened. This method of cleaning will not scratch the glass and is very effective.

For daily or periodic polishing of the front objective lens without removing the barrel, a tuft of clean cotton spun onto the end of a match stick can hardly be surpassed. Oil specks can thus be removed without the aid of a solvent, and the cotton will not leave any lint or smears, and will not injure the soft optical glass. For this purpose it is suggested the cleanest of cotton be used, preferably that which can be obtained in drug stores in round boxes and which can be dispensed from a hole in the cover. —A. F. Schneider, *RCA*.

Improving Exciter Lamp Contact

Trouble due to exciter lamp contact which is caused by poor base contact, may be rectified with a soldering iron.



By making the center contact of the lamp larger (see accompanying diagram), the lamp operates more efficiently and is less aptly to give contact trouble.—R. C. Coble, *RCA*.

Re-tipping Exciter Lamps

A little gadget I find very helpful, is the inside part of an old lamp socket—the part into which you screw the lamp. This round metal piece can be removed and used to hold exciter lamps while you re-tip them. It is somewhat of a problem to solder a good tip while holding the lamp in one hand. This small metal part removed from an old socket fits the round glass end of the exciter lamp perfectly and makes an excellent holder, and by setting it on the table it leaves both hands free to re-tip the lamp. Try it and you will be surprised at the number of lamps you can save this way.—Nelson Spock, *RCA*.

Lacquer for Protecting Nameplates

For protecting modification nameplates, sprocket strobo-discs, etc., a very efficient and convenient liquid can be obtained in the form of a clear nail polish. This actually is a high-grade clear lacquer impervious to oil and comes in small—10c—size bottles equipped with a usable brush.

There also is a new product called "Liquid Thread," available in most 5 and 10c stores. This rubber base white liquid is excellent for firmly plying small labels where there is no oily condition, and may be used on a very wide range of materials.—F. J. Pfeiff, *ALTEC*.

Conservation of Power Unit Rectifier Bulbs

Loading power unit rectifier bulbs by cutting out more series resistance in each exciter lamp circuit and cutting down a.c. input voltage to obtain normal exciter voltage in exciter lamp power unit, will make possible the use of discarded Tungar bulbs where output voltage has been low with normal set-up. It has been found that this method increased the usefulness of discarded bulbs for an additional six months, and in some cases even longer.—H. E. Frisbie, *RCA*.

Repairing Allen Set Screw Wrenches

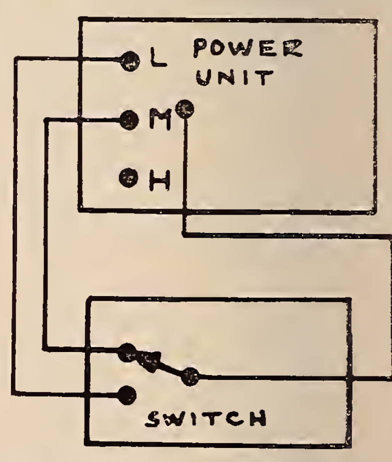
These wrenches become rounded on the ends after continued use. By employing the following procedure, I have increased the normal life of these wrenches as much as three or four times: I cut the rounded end off the heavy diagonal cutters and then grind the ends smooth. The entire rounded section also can be ground off without any cutting, but care should be taken not to allow the wrench to become too hot.—R. H. Bisbee, *RCA*.

Repairing Optical Systems

In several instances where it has been necessary to remove oil from the lens, benzene was found to be an excellent cleaning agent. Lens have been sealed and made oil-proof by screwing the back and front on and up and then backing away about a turn. Run in ordinary nail polish and then screw the ends tight with another coating over the outside. I have never had a lens sealed in this manner take oil.—H. D. Graves, *RCA*.

Adjusting Voltage on Power Unit

Due to unusual peak demands, there have been several cases of voltage drops to the extent that the power unit would not supply high enough d.c. voltage to the 864 tube filament circuits to maintain normal operation. To remedy this condition, a common three-way switch was attached to a mounting plate and this, in turn, was attached to the bakelite terminal plate on the power unit transformer. (See diagram below.) A lead was brought from the regular operating tap, which might be medium and one brought from the next higher step. In

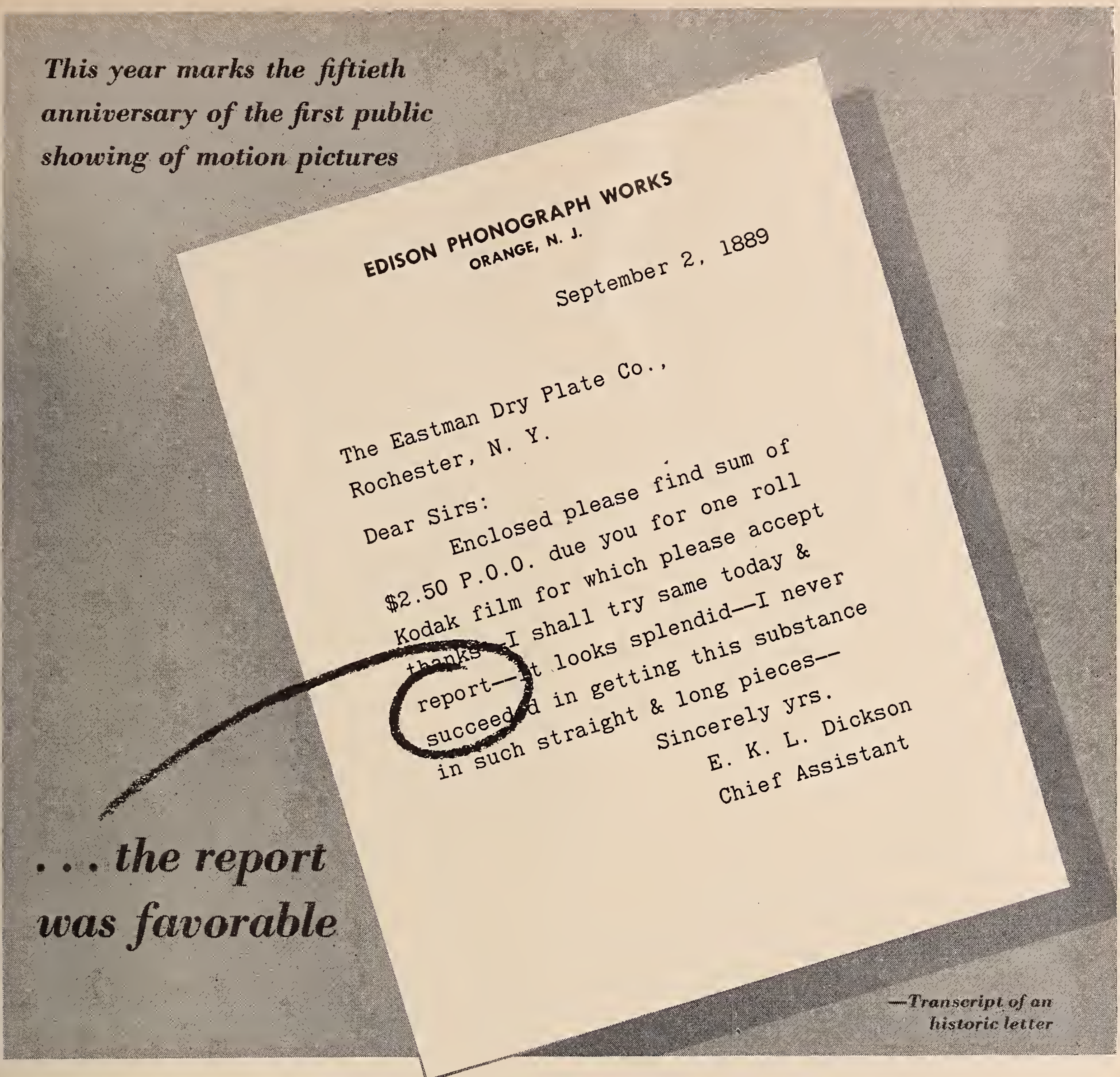


case of a voltage drop, the switch is thrown to connect the higher tap until the voltage is brought back to normal. This effects a quick change and has proved to be very useful in maintaining operation during these fluctuations.—H. D. Graves, *RCA*.

Conserving Exciter Lamp Mounting Boards

Exciter lamp mounting boards of the molded type used in MI-1040 soundheads occasionally develop contract trouble between the stud and connection strap.

(*Continued on page* 29)



THIS $2.50 transaction in 1889 led up to the first public exhibition of motion pictures in 1894. With the help of this roll of Kodak Film, Mr. Edison and his associates were able to perfect the Kinetograph, the camera, and the Kinetoscope, the projector—the first practical motion picture equipment.

Projectionist Re-Designs Sound System; Adds Large Theatre Features

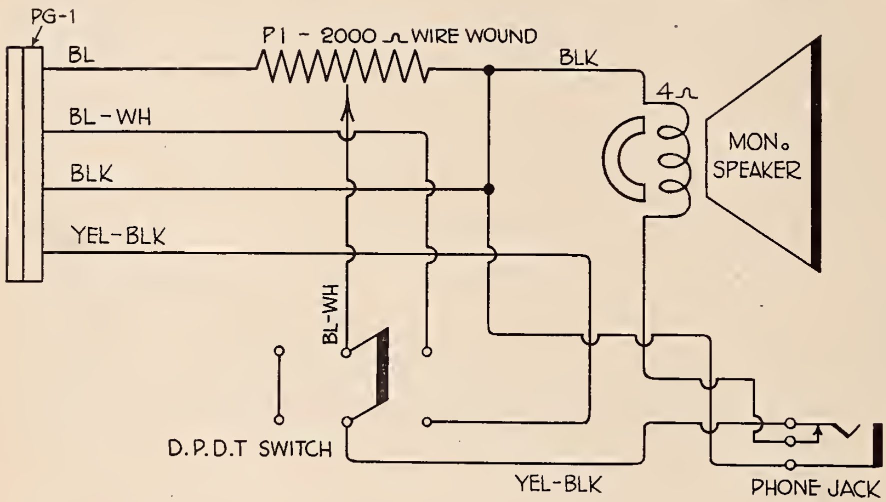
By *RAY S. HANSON*
FERTILE, MINNESOTA

TWO changes which I have introduced into my Type "E" Simplex sound system give me several advantages that my projection room did not previously have. By making these changes I was able to give my small low-cost sound system some of the same advantages that the manufacturer builds into the larger and more expensive Simplex jobs.

One of the two changes consists of the insertion into the circuit of the monitor speaker of a double-pole, double-throw switch. wired as shown in the diagram. This switch serves two purposes. In the first place. if the monitor amplifier should fail I can cut the monitor speaker directly into the main loud speaker circuit, eliminating the monitor amplifier for the time being. Also, when it is necessary to answer the phone. *etc.*, opening this switch temporarily cuts off the monitor speaker. This saves cutting down the monitor volume at the volume control. I can leave the monitor volume control at the best setting for judging proper volume of sound.

The second change is the insertion of the phone jack in the same circuit. This cuts out the monitor speaker and permits me to use the ear phones to listen for noises, *etc.* Also, in place of ear phones I can use my visual volume indicator meter. This is very useful for checking the sound lens adjustment with frequency film, and for checking the frequency performance of the entire system; also for leveling the soundheads by letting the a.c. exciter light shine on the photo cells without film in the heads.

Incidentally, a visual volume indicator meter can be made out of any 0-1 milliampere d.c. ammeter. A small a.c. rectifier (copper oxide type) must be wired in series with the meter; and a ½ meg potentiometer should be added to the circuit to keep down the input to the meter and avoid bending the needle.



IN THE SPOTLIGHT

(*Continued from page* 17)

press car of a train bound for Providence. causing the destruction of the entire contents of the car and seriously burning the baggagemen. So intense was the fire, that the steel car, only a few years old, will have to be completely rebuilt. Film fires, whether in projection rooms or in railroad trains, are difficult to control and too much care cannot be taken to prevent their occurrence.

● In the June, 1943, issue of I. P., we advised our readers NOT to use fire extinguishers in projection room fires. We pointed out that according to the health authorities. carbon tetrachloride in the commercial form used in fire extinguishers is a liquid which produces fumes by evaporation that are injurious to human health.

In a recent projection room fire in Bridgeville, Penna., the lone projectionist on duty was overcome by poison gas fumes when he used the fire extinguisher to put out a blaze caused by the burning of only eight feet of film. The manager of the theatre was also overcome by the fumes when he came up to the projection room to find out why the show had stopped. Again we warn our readers against the use of these dangerous contraptions. and we urge that they take other measures to protect themselves against fire hazards in the projection room.

● H. H. "Dutch" Day. former ERPI man in the Western and Intermountain region, is now located in Panama Canal as civilian sound man for the U. S. Army. His present "run" takes in the Canal Zone, Ecuador, Peru, and Galapagos. He recently applied for membership with the Associated Electronic Engineers and is very anxious to hear from his old friends. He may be reached by addressing him c/o PCD, Motion Picture Service, Quarry Heights, Canal Zone.

● On June 29, Local No. 306, New York City, donated a fully equipped ambulance to the armed forces before a gathering of a large number of local members and many prominent personages. Herman Gelber, president of Local 306. made the presentation, and the ambulance was accepted for the U. S. Army by Capt. Raymond J. Cothran, Special Service Division, Executive Officer of Athletic and Recreation Branch.

During the ceremonies Harry Storin, vice-president of the local, dedicated an honor roll of 132 members in service. Storin's address at the unveiling of the honor roll was simple but eloquent, and impressed his listeners with its sincerity.

Honorary gold membership cards in Local 306 were presented to Rev. John P. Boland, former State Labor Relations Board Chairman, and Paul Moss, City License Commissioner.

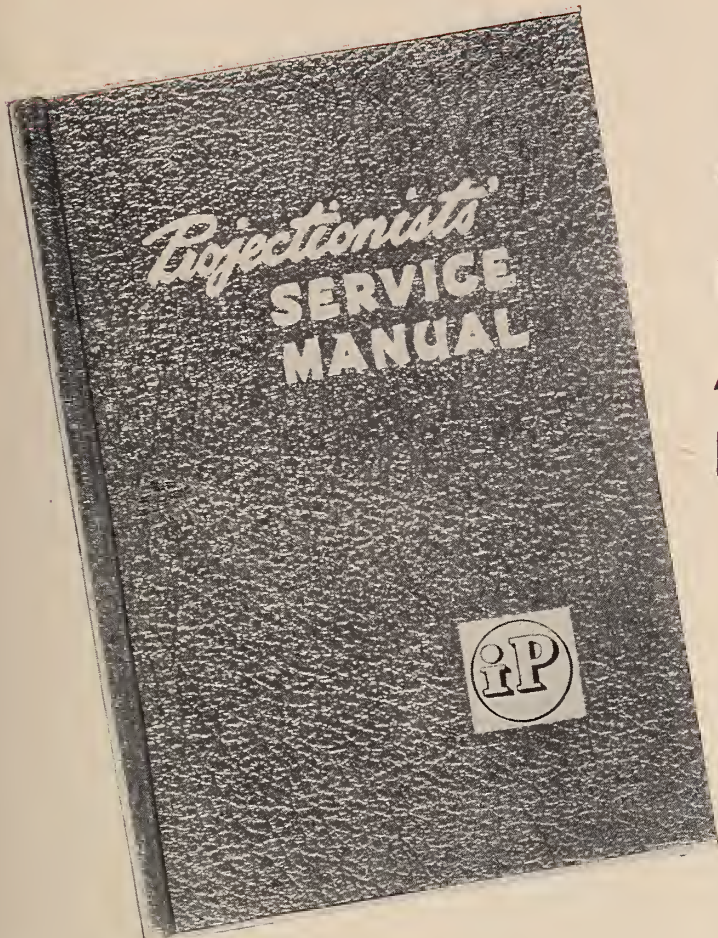
Among the speakers at the ceremonies were Hon. Newbold Morris, president of the New York City Council, and Tom Murtha. president of the Central Trades and Labor Council.

● We are very proud to announce that we have been made an honorary member of Local No. 249, Dallas, Texas. To the officers and members of Local 249, particularly Harvey Hill and Julius Schaefer. we extend our heartfelt thanks for this honor.

● We were very much amused by a report in the trade press that when the Chicago exhibitors heard that Gene Atkinson, Local 110, was requested to organize the theatre managers, they got panicky and voluntarily granted the managers an extra day off each week. No doubt Gene's organizing abilities are pretty well known to these hard-headed exhibitors, and we believe that the reason for their sudden spurt of generosity was due to their desire to wean the managers away from all thoughts of becoming unionized. Judging from our experiences with exhibitors, they do not make concessions to their theatre employees unless they are forced to do so.

● We regret to report the death of another old-timer—George Cox, charter member and president of Local No. 176, Joplin, Mo. Condolences to his family.

YOU NEED THIS BOOK!



The

PROJECTIONISTS' BOOK OF THE YEAR--

A *MUST* IN EVERY PROJECTION ROOM

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A COMPILATION of "At Your Service" items published in INTERNATIONAL PROJECTIONIST during the past few years and now brought out in handy book form.

All items are grouped according to their classifications. About 175 pages of sound practical suggestions relating to the many projection room troubles—their causes and how to remedy them. Diagrams and sketches illustrate many of the suggestions offered. Every projectionist should own a copy of this manual for instant reference and as a trouble guide.

Today with the limitations on new projection room equipment and with the uncertainties of replacements, it is the duty of every projectionist to know the whys and wherefores of his equipment—what to do and what not to do when the equipment fails to function properly—and how to keep the show going until the service inspector arrives at the theatre.

LIMITED EDITION

Place your order now and be assured of receiving a copy of this handy reference manual.

INTERNATIONAL PROJECTIONIST
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Name ....

Address ....

City ....State ....

PROJ. ROOM EQUIPMENT

(*Continued from page* 15)

clean and nothing should be stored on top of the perforated cover plates as this will prevent good ventilation.

Relay contact points should be kept clean and free from pits. Connection terminals on adjustment panel (both front and rear) should be checked once a month to avoid loose connections. All splices between rectifiers and arc lamps should be soldered. All switches should be kept clean and free from arc pitting.

Solid conduit should not be installed so that it is attached to the rectifier housing as this will induce vibrations in the housing with resultant noise.

A drop in output voltage or an unnatural amount of "flickering" on the screen usually indicates the breakdown of one element "stack" in the rectifier. This should be corrected at once. Excessive heating usually indicates transformer trouble, broken down insulation or partially grounded coils. Each indication of erratic operation should be checked at once and reported to the dealer or distributor from whom the equipment was purchased, or call your service engineer for advice.

Installation of these rectifiers should not be wired so that it will be necessary to break the d.c. or output circuit when shutting down or changing over. This causes abnormal current surges in the transformer which may break down the insulation. Rectifiers should be installed so that the a.c. supply will be broken when the lamphouse switch is pulled, or when relay control switch is opened.

It is most important to conserve the copper oxide units which are now being used for arc supply in theatres as replacements are uncertain. To this end the copper oxide rectifiers should be operated below the maximum specified output at all times. Relay contactors should never be "wedged" in closed position and attempt made to operate without the cooling fan. This will surely damage the rectifier seriously.

The primary or line voltage should be constant within 3 per cent, otherwise poor operation will result. The power company should be consulted regarding high, low or fluctuating line voltage.

Sound Screens

The useful life of a sound screen may be prolonged by application of a few precautionary measures before and after installation. Before installing a new screen all stage draperies should be properly cleaned or thoroughly vacuumed to remove all dust which may have accumulated. If this is not done the action of the traveling curtains will transfer this dust to the surfaces of the new screen and reduce the reflective qualities to some extent.

After installation, screen curtain track should be adjusted up or down stage until there is a distance of about four inches from the screen surface to the inner side of the curtain. Careful check should be made to make sure that the curtain does not rub on the screen surface as it travels, nor when it overlaps. If the curtain touches the surface of the screen the surface will be soiled in a short time.

A sound screen should never be installed near a damp or newly plastered wall. If screens are flown up into the fly loft when not in use, proper clearance must be provided so that unused "sets" or lines will clear the entire upward travel of the screen, otherwise screen surface may be marred or ripped. Screens which are to be "flown" should be properly counterweighted so handling will be safe and easy.

If screen is located permanently on the stage, care should be taken that the screen curtain should always be drawn during the time that auditorium is being cleaned, otherwise dust will settle on the screen surface or in its perforations. The screen should be vacuumed at thirty day intervals. A broad nozzle should be used

on the cleaner, and should be held about one inch from the front surface; this will remove all loose dust. Care must be exercised to prevent the metal nozzle from touching the screen surface during this cleaning as a mark will result wherever the metal touches the screen. Ladders or "props" when handled near the screen sometimes result in permanent damage.

Projection Lenses

Projection lenses need only the proper care in handling and cleaning for conservation. The following rules should be observed:

When removing a lens from a projector where the angle of projection is greater than ten degrees, a firm hold should be applied to the lens before the locking device on lens mount is loosened, otherwise the lens may slide from the holder, strike the concrete floor, and be broken.

On projectors with front shutters, the lens mount locking device should never be loosened while projector is running. The reason for loosening a lens under such conditions is usually brought about by the projectionist just having cleaned the lenses but failing to focus before show time. In attempting to establish focus in this way, damage not only to the lens but the entire projector may result if the lens slips into the revolving shutter.

The proper method to employ when cleaning lenses is to remove them from the projector and place them in a suitable clean box or pan on the rewind table. Both front and rear glass surfaces should be cleaned with clean, soft lens tissue, using a circular motion to polish. Cloth should never be used to clean lenses, nor should abrasive cleanser or paste be used. Lenses can be permanently damaged by such cleaners.

Lens combinations should not be separated in the projection room. If such work is attempted, the combinations may be reversed when re-assembling. If this happens the complete projector is out of operation as the lens cannot be focused sharply on the screen until it is re-assembled correctly.

A lens should never be placed on a flat surface when removed from projector because it may roll off very easily and be broken. Oil must be kept away from lens surfaces at all times, or a distorted, poorly focused picture will result. Lenses should be cleaned daily.

In order to conserve, and at the same time obtain maximum efficiency from motor generators used for carbon arc supply, it is necessary to avoid the following factors which contribute to erratic operation and ultimate breakdown of these units.

Overloading: A generator should never be operated above the continuous rating stamped on the manufacturer's nameplate.

Commutator brushes: Correct brushes of proper carbon stock as recommended by manufacturer should always be used when replacements are necessary. Brushes should be free but not loose in brush holders and should always be replaced before they become too short for proper spring tension or commutator contact. A competent electrician should be consulted when brush replacement becomse necessary, or if the projectionist wishes to do this himself, he may obtain the correct procedure in detail from the field engineer who is servicing his projection room equipment.

Commutator: The commutator should

be kept smooth and bright. No grooves or rough spots should be allowed to form on its surface. Roughness causes sparking with an attendent high operating temperature, which lowers the efficiency of the generator. The commutator must be kept concentric with the shaft about which it revolves, otherwise brushes cannot make proper contact and will chatter and arc.

Commutators should be dressed twice a year with wood block and 2/0 sandpaper or a dressing stone. This work must be done by some one familiar with the procedure. Commutators should be "trued up" at least once each year.

If excessive sparking develops between brushes and commutator surface, the cause should be located and corrected at once, otherwise the commutator may be damaged beyond repair in a few hours.

Cleanliness: The generator field windings should be kept free of accumulated dust and dirt. The floor of the generator room should be painted if constructed of concrete, otherwise small particles of sand will be carried to the commutator and bearings when room is cleaned. This will cause excessive wear at these points. A small hand "bellows" or vacuum cleaner can be used for cleaning field coils and brush arm rigging. The generator room should be well ventilated. Nothing should be stored on top of or near the generator as this impedes air circulation.

Lubrication: The generator and motor bearings should be checked often to determine if a sufficient amount of oil or grease is being received for proper lubrication. Sleeve type bearings usually have oil rings which carry the oil from wells in the bearing yoke to the armature shaft. These rings should turn at all times when generator is operating. Oil should be kept at proper level in the bearing wells.

Ball bearings need less attention than sleeve bearings. The proper ball bearing lubricant must be used as specified by the generator manufacturer or a tested equal. Wherever the design permits, the covers should be removed from the ball bearings about once a year and the bearings should be washed free of old grease with clean kerosene and suitable brush, then repacked with fresh lubricant. Excessive heat of bearings indicates lubrication failure. Any noise of a "squeaking" or "rattling" nature indicates that bearings have possibly been damaged to the extent that replacement will be necessary.

Electrical connections: All electrical connections between the motor generators and arc load must be soldered. All terminal connections must be kept tight and free from corrosion. All conductors, switches, fuse ferrules and bus bars must be kept properly cleaned to assure good conductivity. All current-carrying parts must be of ample capacity for load requirements.

The War Activities Committee of the Motion Picture Industry is actively engaged in bringing to the attention of all industry members, the vital necessity to "conserve—eliminate waste—and salvage material." The role of the projectionist in equipment conservation is an extremely important one. Upon their shoulders rests the major responsibility of securing maximum life from projection equipment entrusted to their care.

OFFERS LIGHTWEIGHT FOLDING PROJECTION SCREEN

Radiant Manufacturing Co. is offering its "Fold-Pak," a durable and flexible screen fabric, manufactured in sizes from 7′ x 9′ to 20′ x 20′, and equipped with metal grommets attached in a strong reinforced webbing all around the edge. The screen folds into a small, light carrying bag in briefcase form. The company declares that the fabric will take all the abuse it can be given, and that it is fungus resistant and impervious to grease, oil and light.

AT YOUR SERVICE

(*Continued from page* 18)

These can be made good as new by filing a flat on the shoulder of the stud and drilling and tapping for screws, as is done on later type soundheads. It is advisable to saw through the strap at the shoulder of the stud and remove is so as to allow more room for the head of the screw and the wiring.—IVER GRANN, *RCA*.

Strobo Disc for Checking Speed on Machines

Cut out one of the Strobo discs shown below and paste it to the end of a sprocket, using household cement or shellac. After the cement has thoroughly dried, hold a lamp in front of the Strobo disc and observe its motion. The lamp, of course, must be plugged to a 60-cycle source. For clearer results, use a small neon lamp that can be purchased at most any radio store. If the Strobo disc appears to rotate in the same direction as the sprocket, the machine is running *above* normal speed. If it appears to rotate in the opposite direction, it is running *below* normal speed; and if it appears to stand still, it is running at the *normal* speed of 360 rpm.

If the machine is running above or below normal speed, the exact speed may be determined by counting the number of times the Strobo disc appears to rotate in one minute. For example, suppose that the Strobo disc appears to rotate six times per minute in the same direction as the sprocket is turning, then the actual speed of the sprocket is 360 plus 6, or 366 rpm. If the Strobo disc is turning in the opposite direction, then the speed is 360 minus 6, or 354 rpm. Expressed in terms of film in feet per minute the speed will be

$$\frac{360 + 6}{360} \times 90 = 91.5 \text{ feet per minute}$$

or, if the machine is running slow, the speed will be

$$\frac{354 - 6}{360} \times 90 = 88.5 \text{ feet per minute.—}$$

ALTEC.

Belt for W. E. 209-System

The Gates Vulco 1370 "V" belt may be used with excellent results on equipment using the W. E. 209-type reproducer set.—F. M. WALLS, *RCA*.

Checking Projector Speed

In servicing a PG-134, I check the speed with a loop exactly 24″ long, having 32 frames with one splice in it. Using the projection room clock with its long second hand, or a watch, I count the clicks—45 clicks per minute with a 24″ loop, and 30 clicks per minute with a 36″ loop.—MAURICE RUSHWORTH, *RCA*.

Presenting: Lt. Joseph J. Lynch, Jr.

JOSEPH J. LYNCH, Jr., chief projectionist for Paramount Pictures, now on military leave, was born in Los Angeles, Calif., in 1906. He attended grammar and high schools in that city and in 1925 enlisted in the U. S. Navy, serving until 1929.

He is married and the father of two children, a son of five years and a one-year old daughter.

Having picked up a little projection experience aboard ship during his enlistment, working with an old Powers 6B machine, upon his honorable discharge from the navy he obtained employment at Paramount Studios as a projectionist. running silent pictures. He attended law school at night and graduated from the College of Law with the degree of Bachelor of Laws and a Certificate in Military Law. After five years of running projection equipment in the various projection rooms on the lot, he was promoted to the job of chief projectionist, holding that position until he was ordered to active duty with the U. S. Navy. He was commissioned lieutenant (jg) and is now serving in the capacity of projection officer at the U. S. Naval Photographic Science Laboratory in Anacostia, D. C.

Lt. Lynch is very much interested in his work as projection officer in the navy and says that his present post affords him an excellent opportunity to gain a great deal of knowledge and experience in the field of projection, as the work involves both 16-mm and 35-mm equipment.

I. A. Elections

L. U. 672, KLAMATH-MEDFORD, ORE.

President, E. M. Prouty; *vice-president,* George Love; *business agent* and *secretary-treasurer,* Roger C. Porret.

L. U. 195, MANCHESTER, N. H.

President, Leo R. McIntyre; *vice-president,* M. W. McCrea; *recording secretary,* E. R. Perron; *secretary-treasurer,* George Thibodeau; *busines agent,* Thomas P. Swist; *executive board members,* Leo R. McIntyre, M. W. McCrea, Samuel F. Cooley, George Thibodeau and Edward Freeman.

JOB FOR EVERY SERVICE MAN PLEDGED BY N. T. S.

Walter E. Green, president of National Theatre Supply, in a recent statement, pledged that every National veteran would find a job waiting when he was honorably discharged.

"We want you back," Mr. Green said. "To us you are just as much a National man as if you had gone to work this morning at your old job. We are going to see to it that every National employe honorably discharged from military service desiring re-employment by the company and making prompt application therefor, will be offered a job suited to his or her talents. It is the company's objective to provide a job for every qualified National veteran and to assist every National veteran to qualify for a job.

"This is our pledge to you who have fought for us—that your job is waiting and it is our fervent hope that the day may not be too far distant when you may rejoin us."

<u>This</u> American is <u>not</u> expected to buy an extra War Bond in the 5TH WAR LOAN

But we are.

For each of us here at home, the job now is to buy extra Bonds—100, 200, even 500 dollars worth if possible.

Many of us can do much more than we ever have before.

When the Victory Volunteer comes to you and asks you to buy extra Bonds, think how much you'd give to have this War over and done.

Then remember that you're not *giving* anything. You're simply *lending* money—putting it in the best investment in the world.

Let's Go . . . for the Knockout Blow!

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

Capetown, South Africa

In South Africa...

half a world away from your theatre, exhibitors are facing the same problems and shouldering the same responsibilities which confront you.

For your aims are mutual—to present motion pictures in a manner which will insure the utmost in entertainment to civilians and members of the armed forces to whom the screen offers the greatest prescription for maintaining a healthy balance in wartime.

To top-flight showmen from Capetown, South Africa to Cape May, New Jersey the smooth, uninterrupted hum of Simplex equipment is sweet music. They know that come what may Simplex will see them through—continue to deliver the kind of picture which has made the name synonymous with better projection throughout theworld.

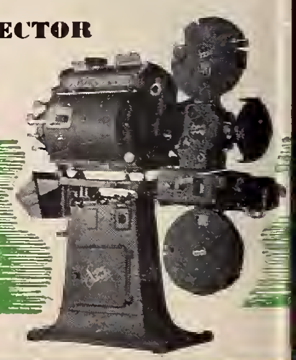
Simplex—IN WAR AND PEACE—THE *INTERNATIONAL* PROJECTOR

NATIONAL THEATRE SUPPLY DIVISION

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

Simplex

INTERNATIONAL PROJECTOR CORPORATION
90 GOLD STREET, NEW YORK, N. Y.



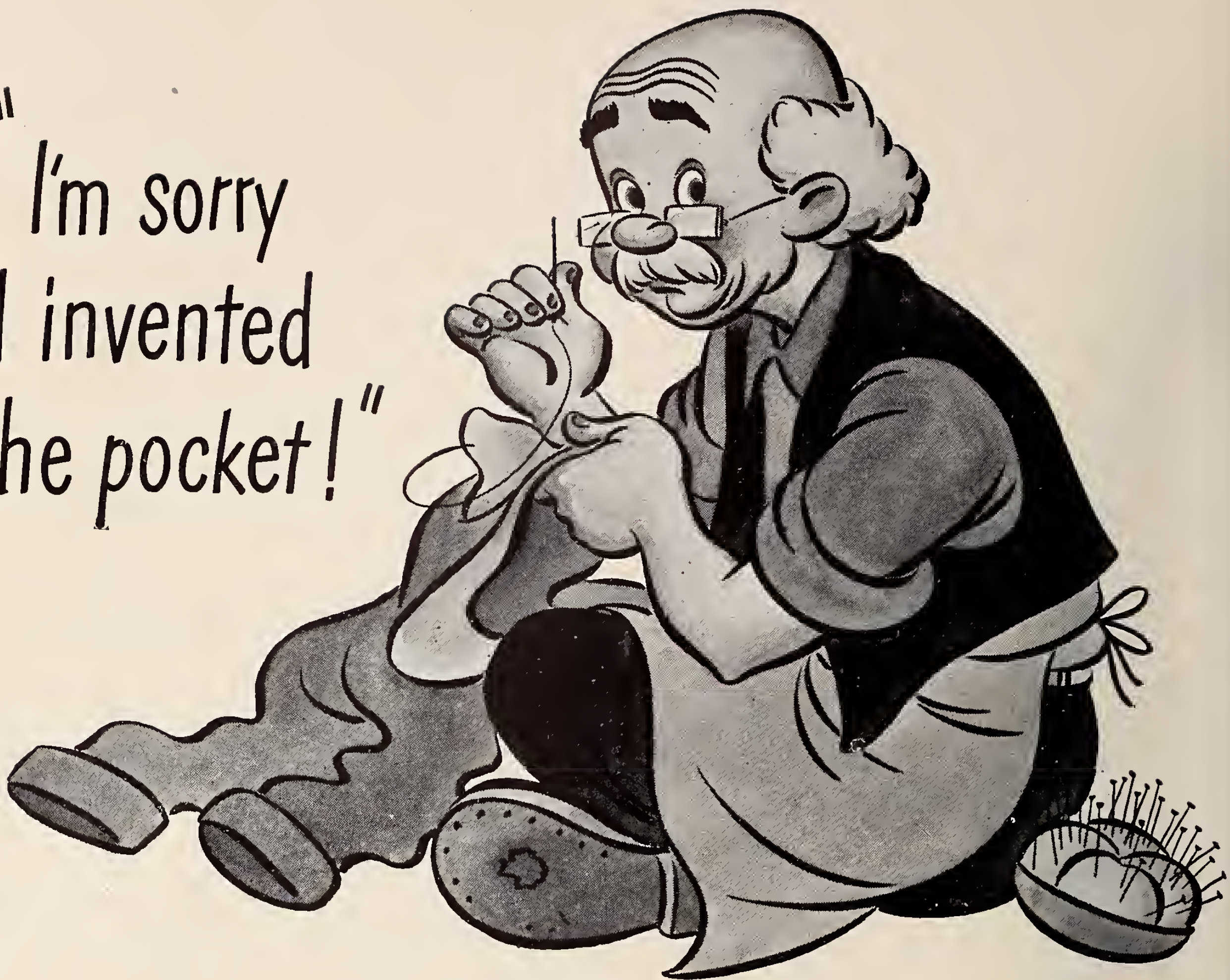
INTERNATIONAL PROJECTIONIST

AUGUST 1944

VOLUME 19 • NUMBER 8

25c A COPY • $2 A YEAR

"I'm sorry I invented the pocket!"



IF I HAD KNOWN that some Americans would be using pockets to hold all the extra money they're making these days I never would have invented them.

POCKETS ARE GOOD places to keep hands warm.

Pockets are good places to hold keys . . . and loose change for car-fare and newspapers.

But pockets are no place for *any* kind of money except actual expense money these days.

The place—the *only* place—for money above living expenses is in War Bonds.

Bonds buy bullets for soldiers.

Bonds buy security for your old age.

Bonds buy education for your kids.

Bonds buy things you'll need later—that you can't buy now.

Bonds buy peace of mind—knowing that your money is in the fight.

Reach into the pocket I invented. Take out all that extra cash. Invest it in interest-bearing War Bonds.

You'll make me very happy if you do.

You'll be happy too.

WAR BONDS to Have and to Hold

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

Official U. S. Marine Corps Photo

"One of my boys shot that"...

YOU are, let us say, a veteran newsreel photographer with the wartime job of training combat cameramen.

First, a little theory—but not too much. Then, the mechanics of the camera. So far it's easy. But from here on the course gets tougher. The boys have to learn that each individual "shot" must have point . . . that the picture as a whole must have continuity—must effectively "cover" the story. The first tries are apt to be terrible . . . but you and your boys keep at it . . . until finally they step out as promising cameramen.

And one day, months later, you watch a wonderful example of combat photography run off—and you're proud as Punch. You can't help singing out, "One of *my* boys shot that."

Eastman Kodak Company

Rochester, N. Y.

J. E. BRULATOUR, INC., *Distributors*
FORT LEE CHICAGO HOLLYWOOD

One of a series of advertisements by KODAK testifying to the achievements of the movies at war

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

Volume 19 AUGUST 1944 *Number* 8

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Monthly Chat

MORE films are produced each month, not by any major studio, but by the Army Air Forces First Motion Picture Unit, located in Culver City, Calif., where, with a comparatively small group of soldier motion picture technicians, the output exceeds that of any other organization. The interesting report of Col. Roy M. Jones, commanding officer, made on the second anniversary of the unit discloses that it has completed 150 training, orientation and documentary films, and has equipped and sent into action combat camera units to serve with every overseas Air Force. Four special units are photographing the invasion of Europe.

In declaring that the production of films for the Air Forces exceeds the monthly production rate of any major studio, Col. Jones said that as the Air Force extended its striking power to every fighting front, the training, equipment, and orienting of technicians and air crews increased the demands for training film production to such an extent that the First Motion Picture Unit now has ten production crews shooting at all times. Plenty of action is resulting from this extensive work.

The unit was organized in July 1942, at the old Vitagraph Studios in Los Angeles, with only one officer, Lieut. Col. Owen E. Crump, and one enlisted man (now captain) Oren W. Haglund. Its initial problem was obtaining skilled motion picture personnel. Permission was granted by the Adjutant General for the unit to enlist men directly from commercial studios, however, and by September 1942 sufficient men had been recruited to start production.

The Hal Roach Studios in Culver City were leased by the Army Air Forces the following month, complete with production equipment. From the inception of the unit, Col. Crump has been in charge of production. He has been assisted by Major Robert Carson and Capt. Richard Baer.

"With the backlog of experience gained from our first two years of operation," Col. Jones said, "we are maintaining the heavy rate of production demanded for total war. The unit has 99 film projects in various stages of work at the present time—research, writing, shooting, and editing. Sixteen more have been ordered, and additional projects are contemplated. Until victory is complete the production of more film to train the greatest number of AAF technicians in the shortest possible time will be the continuing mission of the First Motion Picture Unit."

• • •

The Projectionists' Service Manual is off the press and copies have been mailed to all those who have sent in orders. The limited edition, however, is not going to last long, and others who wish to be sure of getting a copy should send in their orders immediately.

INTERNATIONAL PROJECTIONIST

VOLUME XIX AUGUST 1944 NUMBER 8

The Paramount Transparency Process Projection Equipment†

By FARCIOT EDOUART
PARAMOUNT STUDIOS, HOLLYWOOD, CALIF.

A brief description of the evolution of the modern transparency process projection equipment, from the single-projector, 12-ft screen set-up twelve years ago, to the modern 36-ft screen for black-and-white pictures or the 36-ft screen for Technicolor, projecting 126,000 lumens of light from a triple-headed projector casting three pictures accurately superimposed upon the screen.

FROM an engineering viewpoint the transparency, or projected-background process of special photographic effects cinematography got off to a most unfortunate start. It was never invented, in the strict sense of the word. It was put to practical use from the very beginning, and there was no opportunity of engineering it into a technological co-ordination of methods and equipment.

For a number of years before the present process became a reality, many in the industry who had been specializing on what used to be called the "blue-screen process" or complementary-lighting method of "composite photography," had been thinking how valuable it would be if we could simply project a motion picture upon a translucent screen from behind the set and the actors by the ordinary black-and-white procedure, and rephotograph the screen, set, and actors together, so as to produce the illusion that the projected background was as real and as much a part of the scene as the actual foreground and actors. Three important factors were lacking: (1) we needed a simple, non-mechanical method of accurately synchronizing the background projector and the foreground camera shutters; (2) we needed negative emulsions of sufficient speed and sensitivity to enable us to record the back-projected picture; and (3) we needed better and faster optics, and light-sources of increased power to get a brighter image through our background screens.

Some twelve to fourteen years ago, all these things came in relatively quick succession. The advent of sound gave us a variety of simple electrical hook-ups for interlocking the camera and the projector. The newer "super-sensitive" panchromatic emulsions gave us the needed film-speed. The projection requirements of the increasingly large theatres led to improved optics and light-sources, and the further projection requirements of the wide-film flurry of eleven years ago completed the development.

We finally had what we needed and wanted; and the first production to utilize the new process effectively was Fox's *Just Imagine*. Individuals in several studios assembled various units together as well as they could, and began to make back-projection shots. That the results were successful probably is more to the credit of the skilled craftsmen who operated the equipment than to any enduring merit of the equipment itself.

Yet the many-fathered idea worked. It worked so well that the transparency or back-projection process immediately became a very vital adjunct to production. It even began to eliminate, to a very great extent, many long location-trips, with the increased costs and hazardous delays that such trips generally involve.

It minimized, for example, the need for hiring a full-size ship and, with technicians and cast aboard, cruising expensively up and down the seas in search of the correct combination of backgrounds and weather. It almost completely eliminated the technical difficulties and not infrequent dangers involved in making, by straightforward methods, sound scenes showing our actors riding horses, automobiles, airplanes, speedboats, and the like. It afforded better control of sound recording and lighting in all these scenes. In a word, it conformed ideally to the industry's idea of getting the best possible picture under the most completely

† *J. Soc. Mot. Pic. Eng.*, June 1943.

controllable conditions, and with a minimum of time, expense, and danger.

Producers and directors constantly strive for greater scope through the use of larger, and still larger. screens. When the process first began to be used, a scene inside a closed car with a screen six or eight feet wide was something to be happy about. Before long, demand forced us to find ways of using screens 12, 15, 18, and 20 feet across, not only for black-and-white but for color photography as well. When we finally succeeded in using a 24-foot screen, demands immediately arose for a 36-foot screen.

Makeshift Equipment Used

From an engineering viewpoint, this was decidedly wrong. Our equipment was not engineered for the work, and certainly the various components had not been designed to work together as a unit. We had to build our own equipment, and would usually take the best projector-head we could find and equip it with a camera-type pilot-pin movement. Some of us used Bell & Howell movements, some used Mitchells, adapting them to the service as well as we could.

It was the same thing with projection lenses, projector lamp houses, electrical control systems, and the rest. Though it was carefully and accurately made, the best equipment in any studio was only makeshift for the purpose. It was a miracle that the equipment performed as well as it did; and we were at the end of our resources to produce more light and more scope with the elements we had at hand.

The manufacturers of the component units could hardly be blamed for not producing the special equipment we so urgently wanted. The market was far too small, and the requirements far too individualized to permit even the limited volume production known in the manufacture of ordinary professional cameras and projectors. One studio might prefer Bell & Howell movements for their projectors, another the Mitchell-type registration. What one expert wanted in a lamp house or lens another might condemn. The manufacturer was confused, and could not afford to engineer a product of which he might sell but two or three single units.

Realizing this, a group under the sponsorship of the Academy Research Council decided to attempt to bring the industry's process specialists and the manufactures and engineers together, to the end that we might at least try to set up industry-wide standards and specifications for such equipment, from which the manufacturers could conduct the necessary engineering research and build equipment that would stand a chance of suiting the majority of the industry's transparency or process-shot requirements.

After many meetings we set up a complete basic specification representing definite requirements; auxiliary specifications, which were desirable methods of fulfilling these requirements; and accessory specifications, which indicated features that were desirable, but not indispensable. The specifications were so much beyond our immediate requirements that it seemed almost over-optimistic to hope that they would ever be completely realized.

The start of the project was in 1938, and the specifications were approved in 1939. During 1942 the first complete sets of equipment built to these specifications were delivered, assembled, and put into service. At the Paramount Studio there are at present four of these equipments in operation. Each equipment forms in itself a complete unit for conventional single-head transparency projection, affording illuminating power and convenience of operation hitherto unknown. Any of these "singles" will permit us to make shots, either in black-and-white or in color, that previously would have demanded the old-style triple-head projection.

For scenes demanding even greater scope, *any* three of the new units can be combined into an extraordinary efficient new-type triple-head assembly by simply removing them from their single bases and mounting them on our new standard triple-head base.

Triple-Head Ensemble

In this triple-head ensemble three complete projection mechanisms are used. The center unit is the key machine, and directly faces the screen; the two outer units face inward, perpendicular to the center machine, and their images are reflected to the screen by means of front-surface mirrors. The three images are accurately superimposed on the screen. and the resulting increase of screen illumination is in the neighborhood of 280 per cent. By manipulating the intensities of the three light-sources, or the densities of the three background prints, a considerable degree of control of intensity of the projected superimposed composite image is possible. The superimposition of the three images tends also to eliminate the graininess, which is, of course, further assisted by the use of fine-grain film-stocks in making the prints, or plates, as we call them.

Some idea of the advantages that have been gained through the triple-head technique, and the recently increased efficiency of the new-type units, may be gained from the following figures. A few years ago, when we first had need for powerful process-projection equipment for a Technicolor picture, we borrowed what was then the most powerful single projection unit in the industry, the very fine one owned by Selznick Productions. Using a six-inch $f/1.6$ Hugomeyer lens, it projected to the screen 26,000 lumens of light.

We had already developed our own first triple-head equipment—an assembly of the best units then available before the present Academy specification equipments became available. This enabled us to work successfully in black-and-white pictures with $f/2.3$ lenses on a 24-foot screen, producing about 47,000 lumens.

Today, with the new triple-head equipment, we have worked successfully on a 36-foot screen in black-and-white pictures, and on a 24-foot screen in Technicolor, with a flux of 126,000 lumens!

It would seem that this accomplishment would cover all requirements of transparency projection process work. However, so closely do the demands for greater and greater dramatic scope keep crowding on the heels of technical achievement that it has already proved inadequate. In a recent Technicolor production the problem arose of using a projected background in some very large-scale sequences showing a forest fire. Due to the requirements of story, action, and setting, a 24-ft screen-width was not sufficient. We finally used a spread of 48 feet of background-screen width! More would have been desirable, could it have been obtained.

This probably was the largest projection process set-up so far attempted. We used not one triple-head equipment, but two, projecting on adjoining screens each 24 feet wide. For one of them we employed our own triple unit, and borrowed the second from RKO. With these we achieved our shot most successfully; yet inevitably the demands of forthcoming productions are already greater.

In making these shots, we had the serious problem of operating six projection heads, two Technicolor cameras, and the sound recorder, all in synchronism. The foreground set was quite large and the projectors were never less than 100 feet, and often 150 feet, from the screen, making the total distance from the camera to the back of the projection equipment nearly 300 feet.

This emphasizes the extreme precision required in designing equipment for this service. When a single-frame motion picture image $\frac{3}{4} \times 1$ inch in size is magnified to fill screens up to 27×36 feet, every physical, mechanical, and optical imperfection of the film and of the equipment is magnified at the same time. Moreover, this enormously mag-

(*Continued on page* 23)

Projectionists' Course on Basic Radio and Television

By *M. BERINSKY, E. E.*
MEMBER OF INSTITUTE OF RADIO ENGINEERS

II.—OHM'S LAW and ELECTRICAL UNITS

LET US review briefly last month's installment of this series which was devoted to an explanation of conductors, resistors, and insulators. We learned that all matter contains tiny particles of negative electricity called electrons. In some materials, which act as conductors, these electrons can be made to move from atom to atom with relative ease. Most metals and solutions of acids and salts are good conductors. Of the common metals, silver is the best conductor and copper is second best, with aluminum taking third place. The other metals and their alloys have varying degrees of conductivity. Carbon in its pure form is also a good conductor.

Materials having electrons which are bound very tightly to their atoms and, therefore, cannot pass electrons from atom to atom with ease are called insulators. Ceramics, plastics, quartz, oils, glass, paper, cotton, silk, ebonite, paraffin, rubber, fiber, *etc.*, may be considered as excellent insulators or non-conductors.

Certain materials are neither good insulators nor good conductors, and these are called resistors. It often is desirable to introduce resistance in radio and electrical circuits. Resistance materials common in radio work are carbon mixed with impurities, nickel, silver, manganin (copper 82%, manganese 14%, nickel 4%), constantan (copper 55%, nickel 45%), nichrome (nickel 60%, chromium 15%, iron 25%).

Dynamic Electricity

In the first installment we were concerned mainly with electricity at rest, that is, static electricity. In practical radio, however, elecricity in motion commands our greatest attention and static electricity is of lesser importance. Electricity in motion—*dynamic electricity*—exists when electrons are forced to leave their atoms and move on to neighboring atoms. Such a drift or movement of electrons through a conductor constitutes a flow of electric current.

Everyone knows that a train or an automobile cannot move unless fuel in some form is consumed in the process of locomotion. When we turn on the water faucet in the sink we rarely stop to reason why the water flows; we just take it for granted. The reason that the water flows through the faucet is because large pumps at a central pumping station work day and night to maintain the service. These pumps provide the pressure necessary to force the water through the pipes. In a steam type locomotive, the hurning of coal in a boiler heats water and changes it to steam, thus providing the pressure that pushes a piston and thereby turns the wheels. In an automohile it is the explosion of gasoline mixed with air that creates the pressure needed to move the piston.

Thus we learn that whenever it becomes necessary to move anything through space a force or pressure must be applied to the object which is to be moved. If we are to have a flow of current in a wire, the electrons in that wire must be set into motion so that they can flow through the circuit. Where can we obtain the pressure which will move electrons through wire? The answer lies in the battery, generator, photo-cell, thermo-couple, and piezo-electric devices. All of these are sources of electrical pressure, but for the present we will concern ourselves only with the most common of these, *i.e.*, the battery and the generator.

Many names are used to define electrical pressure, such as "electro-motive force" (often abbreviated to e.m.f.), "potential difference" or simply "potential," "bias," and "voltage." The term most commonly used in radio work is "voltage."

Voltage is the force that is responsible for the flow of electrical current through wires. In commercial electricity voltage is created either by chemical action, as is the case when batteries are used, or by generator action. Of the two methods in use the generator is by far the most popular. Batteries are used only when generators do not prove practical, as in portable equipment, in cars, on small boats, on planes, and in homes that are located in rural districts. Sometimes generated electricity is not suitable for special applications due to the fact that it is not as pure a form of electricity as that which is available from a battery. One such application has been of special interest to the projectionist.

We can all remember the early days of sound pictures. In those days it was almost impossible to light the exciter lamp in the soundhead with commercially generated electricity. This type of electricity had some irregularities in its waveform which caused the exciter lamp to flicker slightly. Although the eye could not discern this slight flicker the photo-electric cell, being much more sensitive than the human eye, could do so easily. The result was an audible hum which was evident throughout the entire picture. The battery with its steady waveform proved to be satisfactory as the source of pressure necessary to light the exciter lamp.

The case just mentioned is an exception because, as a rule, commercially generated electricity is to be preferred to batteries due to the resultant economy and freedom from maintenance worries. Even here the problem was finally solved by the use of a filter which removed the

This is the second of a series of articles on basic radio, television and electricity written especially for the readers of I. P. The author, a graduate of the Massachusetts Institute of Technology and member of the Institute of Radio Engineers, has been conducting courses on these subjects for the past two years for the members of one of the largest local unions in the Alliance. The articles are written in the language of the layman and are devoid of complicated mathematics. We suggest that the readers carefully study them and, without a second reference to the written material, answer the questions appended to each article. The correct answers will appear in the following issues.

As an added service to our readers, the author will be glad to answer all questions on electricity, radio, sound, and television. Questions pertaining to specific equipment should contain the name and model number. Address all communications to this magazine.

irregularities from the electricity and gave a type of pressure similar to that of a battery.

"Difference of Pressure"

To say that a battery or a generator is a pressure is not strictly true. What we really mean is that these devices have across their terminals a difference of pressure. What do we mean by a "difference of pressure"? Reference to Figure 1 (*a*), which shows two tanks connected by a small pipe, will help to answer this question. When the stopcock in this sketch is opened nothing will happen because the pressure in both tanks is equal. This pressure depends upon the height of the liquid in the tanks. Since the water in both tanks is shown to be at the same height, it stands to reason hat the pressures are equal.

Let us suppose that the pressures in both tanks are equal to 100 pounds. The pressure in tank *A* tries to force water into tank *B*, while the pressure in tank *B* tries to send water into tank *A*. Because the forces are of equal strength and are acting in opposite directions, they will neutralize each other and the water will be unable to flow from one tank to the other.

If you will refer to part *b* of Figure 1 you will note that tank *A* now has a higher water level than tank *B*. Due to the higher water level in tank *A*, more pressure will be exerted by it than by tank *B*. When the stopcock is opened water will flow from tank *A* into tank *B* because of the difference in pressure between these two tanks. When the water level in the two tanks is equal the pressure in them will also become equal and no more water will be able to flow between the tanks. It has now been proven that water will not flow unless acted upon by a difference of pressure. The same reasoning holds true with an electric current.

Electrons cannot flow through a wire unless acted upon by a difference of pressure. It has already been stated that a battery or a generator is a device which contains a difference of pressure called a voltage. In the case of air pressure we have a unit called pounds per square inch. For example, air has a pressure of 14.7 pounds per square inch. This unit tells us something about the magnitude of air pressure. In electricity we must also have a unit which tells us something about the magnitude of electrical pressure. The unit which conveys this information to us is called the volt.

For example, let us compare a 6-volt battery with a 1.5-volt flashlight cell. Since the volt is a unit of electrical pressure then 6 volts would represent more pressure than 1.5 volts. If the smaller battery were connected to a low voltage bulb, the bulb would light dimly. Suppose that the small battery were now disconnected from the bulb and the larger battery were substituted in its place. We can guess what would happen. The bulb would now burn brighter. Why? The explanation is very simple. Since the 6-volt battery contains more pressure than the 1.5-volt cell the larger battery is capable of forcing more electrons through the bulb than the smaller one.

The reason why the bulb lights at all is because the electrons that are forced through its filament cause the filament to heat to the point of incandescence. The wire then becomes white-hot and emits light. The number of electrons that pass through the filament will, therefore, determine the brightness of the lamp.

Voltage vs. Current

Last month we established the fact that a flow of electrons through a wire constitutes an electric current. The layman usually confuses voltage and current. These terms are as different from each other as day is from night, despite the fact that one is dependent upon the other. Voltage is electrical pressure, but current represents the number of electrons that flow in a circuit.

Let us look once more at part *b* of Figure 1. When the stopcock is opened water will flow from tank *A* to tank *B*. The amount of water that will flow in a given time depends upon the area of the pipe which connects tank *A* with tank *B*. The water that flows through this pipe represents the current flow between the tanks. If you think of the difference of pressure between the tanks as voltage and the water flowing through the connecting pipe as current, you will have a good idea as to what takes place in an electrical circuit.

The unit which tells us how much electrical pressure is present is called the "volt" in honor of an Italian scientist. The unit of current is called the "ampere" or "amp" in honor of a French scientist who helped discover its existence. An enormous number of electrons must flow through a circuit before you can have as much as one ampere. The exact number of electrons that must flow past a point in one second in order to produce only one ampere is equal to 6,280,000,000,000,000,000. This tremendous figure will give you an idea as to the size of an electron.

Very important in radio and electrical theory is still another quantity called "resistance." Some mention of this quantity was made earlier in this article. Again we refer you to Figure 1. Look carefully at the pipe which connects tank *A* with tank *B*. When a difference of pressure exists between these tanks a water current will flow through the connecting pipe. If the diameter of this pipe were increased, it is apparent that more water would flow through it in a given time, and if the diameter were decreased it is equally apparent that less water would flow in the same time. We would then say that the larger pipe offered less resistance to the flow of water than the smaller one. In electricity the same reasoning holds true.

If two wires of the same material and length but of different diameters were compared it would be found that the one having the larger diameter would contain the least resistance. The resistance of a wire also depends upon the length. If two wires having the same diameters but different lengths were compared it would be found that the longer wire had the greatest resistance, assuming all the while that these wires were made of the same material.

Another determining factor is the material from which the wire is made. For example, a wire made from silver would have a lower resistance than a wire made from copper, and the copper wire would have less resistance than a similar wire made from iron. Temperature also affects the resistance of wire. Most resistance materials have what is known as a positive temperature coefficient, which means that their resistance will increase with increasing temperatures. One exception is carbon; its resistance will decrease with increasing temperature. At a temperature of 273 degrees below 0 Centi-

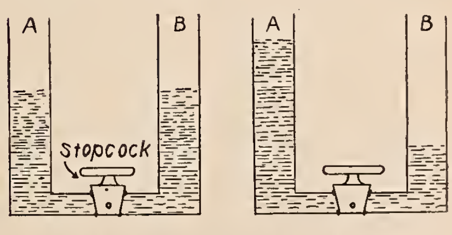

FIGURE 1

JULY QUESTIONS AND CORRECT ANSWERS

1. **Will a positive charge repel a negative charge?** ***No.***
2. **Will a negative charge attract another negative charge?** ***No.***
3. **Will a positive charge attract another negative charge?** ***No.***
4. **In what direction do electrons flow?** ***From negative to positive.***
5. **Do conductors have more free electrons than insulators?** ***Yes.***
6. **Do insulators have more electrons than resistors?** ***No.***
7. **Do resistors have more free electrons than conductors?** ***No.***

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grade all materials behave as if they had zero resistance.

If electrical equipment such as motors, generators, and transformers could be operated at this temperature in practice they would have very high efficiencies. Resistance, like the other two quantities already mentioned, must have some unit which tells us its magnitude. This unit is called the ohm, and was named for a German scientist, Georg Ohm. It is the resistance offered to an electrical current by a uniform column of mercury, 106 centimeters long, and having a cross-section area of one square millimeter at 0 degrees Centigrade.

Ohm's Law

We have now considered the three most important electrical quantities, namely, volts, amperes, and ohms. All three have a definite relation to each other. The man who first discovered this relationship was Georg Ohm, and he was able to prove this relationship mathematically and the formulas which he derived bear his name. This group of formulas is known as Ohm's Law.

Ohm's Law states that the current in an electrical circuit is directly proportional to the voltage and is inversely proportional to the resistance. To put this mathematical statement into simple English we merely say that whenever the voltage in a circuit is increased, the current will also increase provided that the resistance remains constant. Several such simple statements are possible. For example, if the voltage is held constant but the resistance is increased, the current will decease. Ohm's Law is of little value to us unless we know how to use it in the mathematical sense. Three formulas are used in Ohm's Law although they are all simple variations of only one.

The first statement of Ohm's Law says that the current in a circuit is equal to the voltage across the circuit divided by the resistance of the circuit. The second statement of Ohm's Law is that the resistance in a circuit is equal to the voltage of the circuit divided by the current through the circuit. The last statement of Ohm's Law says that the voltage in a circuit is equal to the current multiplied by the resistance in the circuit. Ohm's Law rarely appears in books in the form of a statement, but rather, as a formula. In the formula, *E* stands for voltage because it is the first letter of the word electro-motive force; *R* stands for resistance because the word begins with the letter *R*. For current the letter *I* is used because it stands for intensity of electron flow. You may ask why the letter *C* was not chosen. The answer is that *C* is already being used for capacitance and further use of that letter would create confusion.

In order to use Ohm's Law in a practical manner, we should know how to solve simple problems. The mathematical formula $I = \frac{E}{R}$, is another way of saying $\text{Amps} = \frac{\text{Volts}}{\text{Ohms}}$. The form $R = \frac{E}{I}$ may be written out as follows: $\text{Ohms} = \frac{\text{Volts}}{\text{Amps}}$, and $E = IR$ is the same as Volts = Amps multiplied by Ohms.

We are now ready to solve some problems. Suppose that an electric stove has a resistance of 10 ohms and is connected to the 115-volt mains. Find the current which will flow. Since the current is the unknown quantity, you must solve the problem for I. From the formulas given we see that $I = \frac{E}{R}$. Substituting the known numbers in place of the letters we get $I = \frac{115}{10}$, and solving this problem gives us the answer 11.5 amps.

Let us try another problem. Find the voltage drop across a 25-ohm resistor through which flows a 5-amp current. Since $E = I \times R$, then $E = 5 \times 25$, or 125 volts.

And now let us solve the third and last problem. A resistor takes 2 amps when a 6-volt battery is connected to it. Find the value of the resistor. We find that $R = \frac{E}{I}$, and $R = \frac{6}{2}$, therefore the answer is $R = 3$ ohms.

In Figure 2 we have a simple means for finding the proper Ohm's Law formula. Cover the unknown quantity with your finger and the remaining letters give the correct formula. Figure 3 gives the electrical symbols for a resistor, a battery, and a generator.

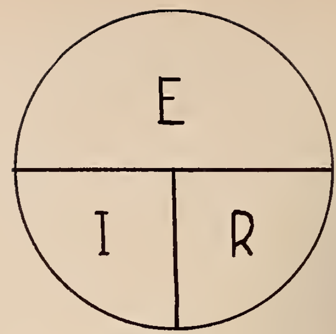

FIGURE 2
Simple means for finding the proper Ohm's Law formula

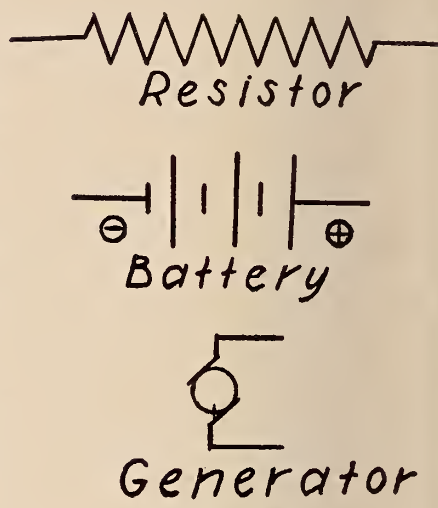

FIGURE 3
Electrical symbols for resistor, battery and generator

Solve the following problems—find the unknown:

1. I = 15, R = ?, E = 30
2. I = ?, R = 25, E = 2
3. I = 4, R = ?, E = 18
4. I = 1, R = 1, E = ?
5. I = ?, R = 48, E = 110
6. I = 2, R = 2, E = ?

The correct answers to these questions will appear in the next issue.

CHICAGO L. U. 110 BOND DRIVE EXCEEDS GOAL BY $26,386

In its recent $150,000 bond drive for the purchase of an Army Hospital Service plane, Local No. 110, Chicago, exceeded its goal by $26,386. The plane, which is to be presented to army officials, will be named in honor of Local 110 members serving in all branches of our armed forces.

N. T. S. PROMOTES AUDITORIUM SUPPLIES IN BOOKLET

August and September promotions of National Theatres Supply will feature auditorium supplies, with the heart of the campaign being a booklet entitled "The Ballad of Showman Chum." This booklet features "Showman Chum," the wise showman who "coddles his auditorium" with essential supplies from National. The showman's story is presented in humorous verse, supported by cartoon style illustrations.

G. C. HENRY JOINS THE SOUND EQUIPMENT STAFF OF RCA

Glenn C. Henry has been appointed to the staff of the Sound Equipment Section of the Radio Corporation of America, in charge of sales of engineered sound systems and components. He formerly was chief of the Audio and Industrial Section of the Radio and Radar Division of the War Production Board. In announcing the appointment Barton Kreuzer, manager of RCA's Sound Equipment Section, said that Mr. Henry will have the responsibility for developing products and services in the field to which he has been assigned.

How to Make Your Own Schematic Diagrams—Preliminary Steps

By *LEROY CHADBOURNE*

In many projection rooms, especially at this time, complete schematic diagrams of the sound apparatus do not exist and cannot be obtained. This is a serious situation for the theatre. The projectionist must carry on his work under the heavy handicap of never completely knowing what he is doing. The only remedy is for him to study the apparatus in detail and make his own schematics from it. A number of preliminary steps are necessary to success; one of the most efficient procedures is to begin by making wiring diagrams. This work, which is difficult and intricate, can only be done outside of show hours.

IN MAINTAINING sound equipment, nothing is more necessary than a good. clear schematic diagram. Without it, the projectionist is working in the dark. All sorts of signs of threatening trouble may show themselves, and the projectionist may not know what they mean if he has no information as to the circuits involved. He may be a very skilled projectionist, but if his apparatus is a "mystery box" to him he might as well be an amateur. There is no substitute for information.

Lack of information arises from several causes. The schematics furnished with the equipment may have been lost over a period of years, or soiled beyond possibility of reading them. Some manufacturers have followed a policy, which this writer must insist is short-sighted, of refusing to release schematics of their theatre equipment. Some of the smaller manufacturers that made sound apparatus a few years ago are now out of business; all manufacturers are currently occupied with war work and requests to them for a new schematic may in some cases encounter long delays, if it can be granted at all. (Other manufacturers, of course, can and will supply schematics promptly.) In very many cases the sound apparatus has been modified or modernized; and sometimes schematic drawings have not been changed to correspond, which leaves them worthless.

Where complete and accurate schematics are not available in the projection room the manufacturer should be asked to supply them; where the apparatus has been modified the service inspector, supply dealer, or other person responsible for the modification should be asked to modify the projection room's schematic diagrams.

Need for Schematics

In the absence of full information the only alternative is to collect it piecemeal when needed, which means that any trifling repair or adjustment may turn into a big job. If the projectionist has to trace his circuits as he goes along, and perhaps sketch them on a scrap of paper, dubiously and under pressure of time, any ten-minute adjustment may take him half a night. What he actually will be doing (what anybody does under such circumstances) will be making a partial schematic, on paper or in his head, as a preliminary to and as part of, the work of effecting some small repair. It is far more efficient to make the whole schematic in advance; carefully, accurately and under no pressure of emergency; and have it on hand.

Furthermore, reference to a complete schematic will often show at a glance that some warning symptom, for instance, in part A, such as overheating, is really due to a fault in part B, and can only be corrected at part B, and not at part A.

The fact that a theatre is under contract for projection room service, and can call a service inspector at any time, does not mean that the projectionist can safely be left in ignorance of the details of his equipment. The competence of the service inspector who visits the theatre once in a while is not a complete substitute for the watchfulness of the projectionist who is with the apparatus every working moment. Some trivial misfunctioning of the equipment may be taken for a warning of impending breakdown, and a really serious symptom of trouble neglected as unimportant. The projectionist cannot be blamed in such instances, for if he is denied the information necessary to the proper upkeep of his equipment, he cannot take the responsibility for its smooth functioning. With a proper schematic of his equipment, he could undertake to make emergency repairs, when necessary, until the service inspector arrives at the theatre.

However, the service inspector is no magician; he, too, needs a schematic. He may have one, even though it is (by some manufacturers) denied to the theatre. But in very many cases the age of the equipment, or modifications made in the past and not properly recorded, or other causes, will leave the service inspector also without full information. Because of long familiarity with repairing similar equipment, the inspector may have a partial schematic in his head. But that is not a satisfactory substitute for a complete schematic on paper, and his work may sometimes take half a night (mostly spent in tracing wires) where with a complete circuit before him he could finish the job in half an hour.

Schematics Take Time

Making a schematic takes time. How much time depends on the nature of the apparatus, and on a great many small details, such as the ease with which wires can be traced, or the condition and even the cleanliness of the internal wiring and component parts. The simplicity or intricacy of the circuits is, of course, an important factor in determining the amount of time needed.

The work cannot possibly be done while the show is on. In the first place, it will in almost every case be necessary to disconnect some wires, perhaps a great many wires, in order to trace them, and to discriminate clearly between main and branch circuits. Secondly, much sound apparatus is dangerous when the current is on; many amplifiers and so forth have safety switches which automatically cut off the current when the apparatus is opened. It is possible to jam such switches, but that is dangerous. Lastly, and most important, tracing a complex circuit is not easy; it needs undivided attention, and any such work done by the projectionist in show time may prove wrong and therefore worse than useless.

The work of making a schematic should never be hurried unduly. A schematic 99 percent right is no good. This writer remembers all too clearly the time when it cost a theatre a whole night's overtime for a job that should have been completed in less than an hour—because the schematic was wrong. *Nothing* that was done had the slightest effect on the trouble until the fault in the schematic was found, wires traced, and the schematic corrected. After that, making the actual repair took less than half an hour. Previously, and throughout a long night, the work had been attempted in ignorance of the real facts. Naturally, no results were obtained.

Now, that schematic wasn't *all* wrong. It was 99 percent right. There was just

one little modification made in the past, which someone had neglected to add to the drawing. That little difference was enough to cost the theatre a night's overtime pay.

A schematic drawing must be perfect, or it is misleading. Whatever time is needed to make it perfect must be taken. If everyone concerned does not agree to that, it's waste of effort even to start the job.

A schematic is not a mere pencil copy of the parts and wiring in a piece of apparatus—such a copy is the wiring diagram. The schematic diagram is a shorthand interpretation of electrical relationship; a drawing in which those relationships have been translated into simplified symbols. That work of translation takes thought and carefulness—and therefore time.

Because the work of translating the electrical facts into schematic symbols is not easy, but tricky, it is best to make a wiring drawing first, and then make the schematic from the wiring drawing rather than from the actual apparatus. This may seem to involve waste of effort in that it means making two drawings instead of one. Actually, it is the fatest procedure for persons who do not have long experience in the process.

When the work is done this way, the schematic itself is madc sitting at a table, desk, or bench, without constantly jumping up to refer to the apparatus, and the projectionist can concentrate all his attention on the difficult job of translating facts into symbols. If he tries to do that while squatting on one knee, tracing a wire with one hand, holding a flashlight in the other, and carrying a pencil in his mouth, chances are excellent that he'll get something wrong.

Wiring drawings, moreover, are very valuable in themselves, and many manufacturers furnish them along with schematics; they are next in value after schematics for all types of maintenance and repair work. They do not and can not replace the schematic but they supplement it, and make its use easier and more practical.

Making the wiring drawing first is not only the fastest and most accurate way to make the schematic, but additionally provides the projection room with two valuable tools instead of only one.

FIGURE 1

The Wiring Layout

Assume the problem is to make a schematic diagram of the amplifier shown in Figure 1. Begin by making a wiring diagram. And the first step toward making a wiring diagram is to make a wiring layout, or parts layout—a sketch showing the different parts which are interconnected by the wiring.

The shelf in Figure 1 slides out and turns upside down for efficient servicing; therefore every part and wire can be clearly seen (though all do not show in the drawing). But there is apparatus on top of the shelf; other apparatus underneath it; there are studs and connections in front of the terminal strip panel and apparatus mounted behind that panel. Some parts are located behind other parts. All these components cannot be represented accurately in one flat sketch. Therefore, two or three sketches must be made, in this case.

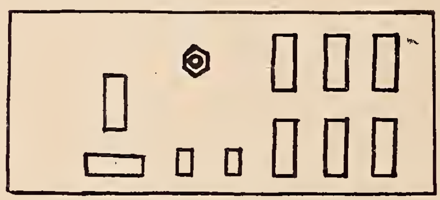

FIGURE 2

No sketch need be made of the top of the shelf because there is almost no wiring above the shelf.

The shelf may, therefore, be turned over, and a layout, or sketch, made of the parts as they appear on the underside, indicating each one as nearly as possible in the place where it appears on the actual apparatus. Similar sketches may be made of the front of the connection panel, and of the back of that panel. Figure 2 is a layout of the front of the panel.

As many sketches should be made as may be necessary to show every single piece of apparatus and its connection points; the important matter being the connection points—studs, prongs, terminals, anything that a wire connects to. The apparatus itself need not be drawn. For example, there is no occasion to show the tubes. A circle or oval indicating a socket is sufficient. Draftsmen sometimes elaborate, as in Figure 3; projectionists need not.

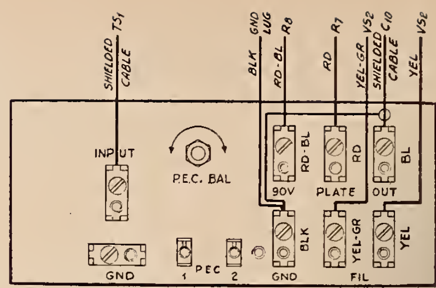

FIGURE 3

Figure 3 is the completed wiring drawing, representing two stages of work beyond Figure 2. Figure 2 having been completed, the next step normally would be to put in the necessary information. This is, along the top row: INPUT, P.E.C. BAL., 90 V., PLATE and OUT. Along the bottom row: GND., P.E.C. 1 and 2, GND. and FIL. The final step is to add the wires.

Wiring Diagram Details

Such designations as those shown in Figure 3 may not always be readily visible on the apparatus. Sometimes they are present but obscured by dust and grime; in which case a little cleaning is required. If they have been omitted, it may be necessary to leave them out temporarily until the information can be obtained indirectly. For example, the ground terminal of Figure 3 could be identified as such (if necessary) by tracing its external connection; and often more easily by noting that it is bonded to chassis internally. Similarly, when information is not provided, various other external or internal circuits can be traced to obtain it.

When the necessary information has been added to Figure 2, the wires are drawn in, just as they appear in physical fact, and then, if they are color coded, their colors are noted on the diagram. Here again a little cleaning may be necessary, because if the equipment is old the wires may have collected enough dust to make their colors invisible. A bit of carbon tetrachloride on a rag will usually clear up that difficulty.

In the cases of Figures 2 and 3 there are at most four steps: (1) make Figure 2; (2) add the apparatus information: (3) add the wires, and (4) add the wire information. But Figure 2 consists only of terminals. In the case of most wiring diagrams one additional step is necessary—adding the terminals; that is, adding the prongs to the circles that indicate sockets; adding terminals to the circles or rectifiers that indicate condensers, and

(*Continued on page* 25)

IN THE SPOTLIGHT

By HARRY SHERMAN

THE sudden death of Brig. Gen. Theodore Roosevelt in Normandy brings to our mind the words of his illustrious father anent organized labor.

"If I were a factory employee," said the late Pres. Roosevelt, "a workingman on the railroads, or a wage earner of any sort, I would undoubtedly join the union of my trade. If I disapproved of its policy, I would join in order to fight that policy; if the union leaders were dishonest, I would join in order to put them out. I believe in the union and I believe that all men who are benefitted by the union are morally bound to help to the extent of their powers in the common interests advanced by the union."

● Detroit Local No. 199 has joined the ranks of those far-seeing and progressive I. A. local unions that are now inaugurating ambitious educational programs for their memberships. Plans are being made for a special training course to prepare projectionists for television when it hits the theatres in the post-war days, as it inevitably will. Frank Kinsora, president of the local, appointed Houston S. Morton chairman of the Educational Committee, to be assisted by Earl McGlinnen.

We should like to refer the worthy chairman to the new series on basic radio and television now appearing in I. P. Since the series began many I. A. locals throughout the country have subscribed to the magazine for their entire memberships—why not Local 199?

● It certainly looks like a "new deal" for Chicago Local No. 110. When Gene Atkinson, the new business manager, took office last February, we predicted that he would turn out to be one of the most able and progressive union officials in the I. A., and all signs indicate that we picked a winner. To date Gene has been in office little more than six months and not only has he outlawed former practices that brought disrepute to the local, but he established benefits for the membership that can have but one result—a more harmonious relationship between the members and the officers of the local.

One of his first moves as an official of the local was to cancel the phony verbal contracts that existed for many years between Chicago exhibitors and former Local 110 officials. A new collective bargaining agreement with 90% of Chicago's exhibitors has just been signed by all the newly elected officers of the local and the officials of the motion picture circuits. This contract, which runs to September 1, 1945, clearly sets forth a wage scale based upon the seating capacity of a theatre and its admission price, so that all theatres of the same classification and admission price will pay the same wage scale to their projectionists—from $2 to $3 per hour. In addition to vacations with pay (first time for Chicago projectionists), the members of Local 110 will be paid for that extra half hour "preparation time," a practice that has been a thorn in the side of many local officials throughout the country.

At a meeting called for the ratification of the new contract, which was praised by Felix Snow, I. A. vice-president, as one of the best ever signed, the members demonstrated their approval by staging a ten-minute ovation for Gene.

In addition to Atkinson, the local was represented at the negotiations by James Gorman, president, and Clarence Jalas, assistant business manager.

● We almost had our ears pinned back several months ago when we stated that projectionists in Canada were placed on the essential list. We received word from one of our Vancouver correspondents that under an amendment to ruling PC 246 theatre employees rejected for military service will be removed to essential industries. Projectionists, who were classed essential under a *previous* ruling are not affected by this order.

● Officials of Local No. 348, Vancouver, Canada, announce the signing of new wage contracts for their members which call for time and a half for all overtime. Orin Jacobsen, I. A. representative, assisted in the negotiations.

● Here we are back on our favorite topic—the greed of the motion picture theatre exhibitor. A bit groggy from their swollen box office receipts and laboring under the delusion that they can get away with anything short of murder, a number of theatre owners in the larger cities have gone haywire in setting their admission prices.

At one time it was customary for a theatre to open at a fixed admission price, with increases at specified times of the day. Evening prices usually went into effect about 6 o'clock. Today, however, the scheme works differently. The admission price now is based upon the line at the box office, regardless of the time of day—the longer the line, the higher the admission price. This, of course, does not refer to all the first-run houses but chiefly to the second- and third-run houses. A first-run house like say, the Music Hall in New York City, is consistent in its price policy—80c admission price until 6 o'clock, and $1.10 thereafter, regardless of the length of the line at the box office windows or the super-duper quality of the presentation.

In this connection we read with considerable interest an exchange of letters that appeared in the New York Sunday Times several weeks ago between the head of a well-known circuit and several disgusted moviegoers who voiced their protests against the practices just mentioned. This exhibitor defended the right of the theatre owner to increase his admission prices, weakly arguing that the increases are justified if a picture has what he termed "that extra measure of entertainment satisfaction which is the distinguishing mark of all great productions." That, we say, is just a lot of hooey.

However, in raising the admission price for a picture that this exhibitor claims has more than average entertainment value, is the projectionist—the man who is responsible for the quality of the show—rewarded with a little bonus or a few extra dollars for his part in bringing the extra shekels into the box office? Yes, that was a horse-laugh you just heard.

Incidentally, it might be well to bear these facts in mind for the post-war days—for as soon as the war is over and the public gets over its spending spree, these same exhibitors will put on their crying jackets and plead for a reduction in projection room costs—"*a temporary reduction to tide them over the slack season.*" That old familiar refrain—"*a temporary cut.*" So many local officials fell for that gag and agreed to salary cuts ranging anywhere from 5 to 15%—cuts that in a great number of instances have not yet been restored.

Even today, with people flocking in droves to the movies and exhibitors mak-

ing more money than ever before, the head of a fairly well-known circuit in these parts had the temerity to ask the business agent of a local union for a cut. Well, they tried it before and got away with it—you can't blame them for trying again.

● Now that the 5th War Loan drive has ended successfully, we are confronted with stories in the trade press of the splendid cooperation extended to the government by the motion picture industry. Yes, everybody gets its share of credit—the producers, the exhibitors, and the theatre managers—but nary a word for the I. A. men who merely worked overtime without pay showing pictures promoting the sale of bonds, bought war bonds for themselves and in their spare time sold them at various rallies and meetings. Well, boys, let us blow our own horns if nobody else will do it for us. We helped put the drive over, and credit or no credit, we have the satisfaction of knowing we played an important part in its success.

● It is indeed a rare occasion when a government official throws a few words of praise in the direction of the projectionist. In his recent annual report, O. J. Silverthorne, chairman of the Motion Picture Censorship in the Province of Ontario, made the following statement:

"Theatre safety beyond the effect of the regulations depends on the right man in the right place. The man who handles the film itself as it is shown, is the chief custodian of the safety of the patron. Ontario is fortunate in having highly skilled and conscientious projectionists who, though rarely seen by the patron, are the persons upon whom he depends most. Projectionists must revise and repair all films to make sure that it can withstand the operation of the machines. This is no easy task. Because of the transportation difficulties in winter, film often arrives with little time to spare and the projectionist must work hard to overcome past careless handling and seek to have the film in first-class shape for further showings."

Reading between the lines of the Hon. Silverthorne's report, we gather that he is heartily in favor of the two-man projection room which is prevalent in Canada. Ontario is the largest province in Canada and has 412 theatres, 877 projectionists, and 210 apprentices.

● Detroit Fire Marshall Edward Hall slapped a ban on the running of 16-mm film on portable equipment, unless a specially constructed projection booth is used. This ban affects a number of charity shows given by the Variety Club of Michigan in various institutions, as well as showings in night clubs and hotels. In Chicago, as a result of several theatre fires, Fire Prevention Chief Fenn has declared that all 16-mm portable shows must be run by licensed projectionists.

It looks very much as though the fire officials are finally waking up to the danger of laxity of fire laws in public places where motion pictures are shown.

● We sincerely hope that the A. F. of L. and the CIO will get together some time before the war ends. We believe that the amalgamation of these two organizations would result in added strength and prestige for organized labor.

● We quote a statement made by Bruce Steinmetz, president of Local No. 213, Butte, Montana, at a Labor Day rally several years ago:

"To disagree and have individual opinions is traditionally American, but let no foreign power underestimate our ability to unite against a common foe."

Herr Hitler can vouch for the force behind that statement.

● Tom Harmeson, member of Local No. 194, Indianapolis, Ind., recently sent us a subscription order for his son, Claude, now serving as a radio technician with the Air Force in Burma. Writes Tom: "Claude is also a member of Local 194 and he asked me in his last letter to make sure that I. P. is sent to him each month so that he will be kept posted on what's what in the projection world, and on the latest happenings in the I. A."

Harmeson has been a member of Local 194 for over thirty years and states that he is proud to have had a hand in building up his local from its $12-a-week days to its present strength. The International Alliance has many, many members like Harmeson who take great pride in the wonderful strides made by our organization and who are happy to have played even a small part in its steadily increasing strength in the amusement world.

● In checking the fire reports that reach our desk from time to time, we notice that the majority of the projection room fires reported occurred in one-man-operated projection rooms. We have heard a great many phony excuses offered for the origin of many of these fires, but the one that takes the cake is the excuse offered by an inexperienced projectionist whose film caught fire during an electrical storm.

He claimed that the storm turned off the electric current in the theatre, stopping the projection machine. When the storm subsided and the current came on again, "the powerful light in the projection machine set fire to the film." This tops the story about the lone projectionist on duty who saved the day, to hear him tell it, by tearing the burning film from the top magazine, slamming it into the lower magazine and shutting the door, thereby smothering the blaze.

● Tip to Canadian locals—J. J. Fitzgibbons, president of Famous Players Canadian Corp., recently issued a statement that "theatres operated by my company will add television to their regular motion picture programs when it becomes available. The speed television may have in delivering news events will be its greatest asset to theatres." That's your cue, boys, to get busy and brush up on your technical stuff.

● Although Gus Hilton, business agent of Local No. 310, Atlantic City, N. J., looks like a youngster himself, he has two sons in the U. S. Navy. The older boy has been in service for quite some time, and we learned that the younger one recently donned the uniform of a gob. Our best wishes for their safe re-

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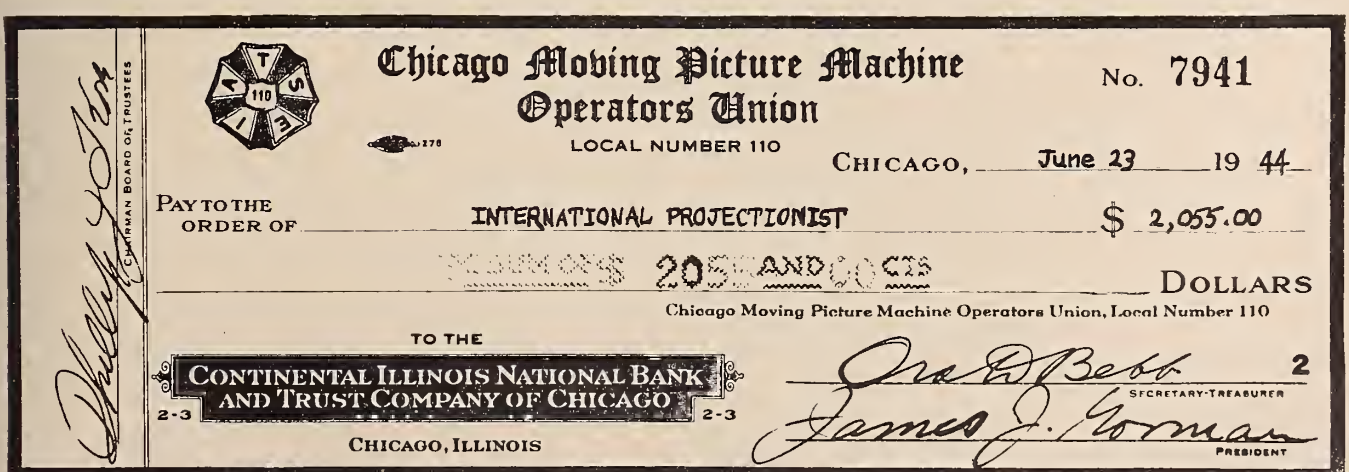
Chicago Moving Picture Machine Operators Union
LOCAL NUMBER 110
No. 7941
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PAY TO THE ORDER OF INTERNATIONAL PROJECTIONIST $ 2,055.00
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CHICAGO, ILLINOIS
SECRETARY-TREASURER
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James J. Gorman
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What the progressive leaders of one of the larger I. A. locals think of the worth of I. P. This check represents payment for a two-years' subscription order covering the entire membership of Local No. 110, Chicago, Illinois.

TELEVISION TODAY

XI. — Television Receivers

By *JAMES FRANK, JR.*

THE television receiving system is naturally built around its cathode ray tube. Essentially television receivers are alike although they will vary in details. The function of the television receiver is to not only reproduce the televised image but also to reproduce the accompanying sound. The use of a television receiver for the picture only together with an existing sound broadcast receiver is not considered particularly practical. The sound is transmitted in the same channel with the picture signals. These are in the ultra short wave spectrum. A large majority of the sound broadcast receivers now in use are not designed for reception of these ultrashort waves. Furthermore, the problem of finding the accompanying sound for a particular television picture on a separate receiver might be cumbersome.

There are many makes and types of television receivers which were on the market prior to the war and which will be available in the post-war period. Figure 55 shows a block diagram of a typical television receiver. Television receivers were available in both the more expensive console type, similar in appearance to expensive sound broadcast receivers, and in the smaller less expensive sets. The smaller sets, of course, used smaller cathode ray tubes with consequently smaller television image.

The length of the cathode ray tube is important in the design of the television receiver. If it is short enough to be mounted on the receiver chassis in a horizontal position, it is possible to view the picture directly from the fluorescent screen. This is done in the smaller sets. Long tubes, however, which involve larger images, are generally mounted vertically so that viewing is accomplished through a mirror mounted in the inside of the console lid in such a position that suitable viewing is possible from the front of the console when the lid is raised as shown in Figure 56. This latter method, of course, involves some loss of light by virtue of the efficiency of the mirror.

The television receiver is a much more integral part of the entire television system than is the present sound broadcast receiver. A change in any of the standards such as radio frequency channel width, number of scanning lines, rate of repetition, synchronizing signals, etc., would render the receivers inoperative. It is, therefore, reasonable to expect that the standards now agreed upon will not be hastily changed in the near future.

In the television transmitting system, some synchronizing impulses were added to the video signals in order that the electron beams in the receiver cathode ray tube be kept in accurate step with that in the pick-up cathode ray tube. When the radio frequency signals which have been transmitted through space are received by the antenna and transmitted to the television receiver, they are amplified, detected or rectified, and then amplified again.

Sound Signals Diverted

The sound signals accompanying the video signals are diverted after detection in a separate channel where they are amplified and reproduced by a loudspeaker in the usual manner. The video signals are then sent in their entirety to the cathode ray tube where they are made to control the grid. By changing the charge of the grid from positive to negative as the signal itself fluctuates, the electron beam is varied in intensity so that the image reproduced on the fluorescent screen is likewise varied in light intensity.

A portion of the entire video signal is directed to a synchronizing separator. By amplitude and frequency selection, the horizontal and vertical synchronizing impulses are separated and sent to their respective generators. This synchronizing separator is designed so that video signals cannot go beyond the amplitude of the signal between the scanning lines —the blanked-out portion upon which the synchronizing impulses are superimposed. This assures that the video signals will not interfere with the synchronizing action as they are not of great enough amplitude to pass through the separator.

Due to the wide divergence between the time constants of the horizontal and vertical synchronizing signals, either may be removed from the composite synchronizing signal by means of a very simple frequency selective circuit. It should be noted that the synchronizing signals are in the negative direction. When they are applied to the grid of the reproducer cathode ray tube, they bias the grid negatively and extinguish the electron beam which is desired.

In order to deflect the electron beam in the cathode ray tube it is necessary to apply the same type of saw-toothed current to the horizontal and vertical deflecting coils as was done at the pick-up tube. The deflecting in both the kinescope and the oscillight is done electromagnetically. Electrostatic deflection is possible but is, in general, more costly.

Oscillator circuits are provided with their respective amplifiers to produce the desired saw-toothed currents. These deflecting currents are synchronized with the transmitter by the application of the synchronizing impulses to the individual oscillators. Thus the electron beam is made to sweep across the fluorescent screen from left to right, moving downward at the same time, so that it sweeps the screen $262\frac{1}{2}$ lines 60 times per second interlaced, returning after each time to the upper left corner to start all

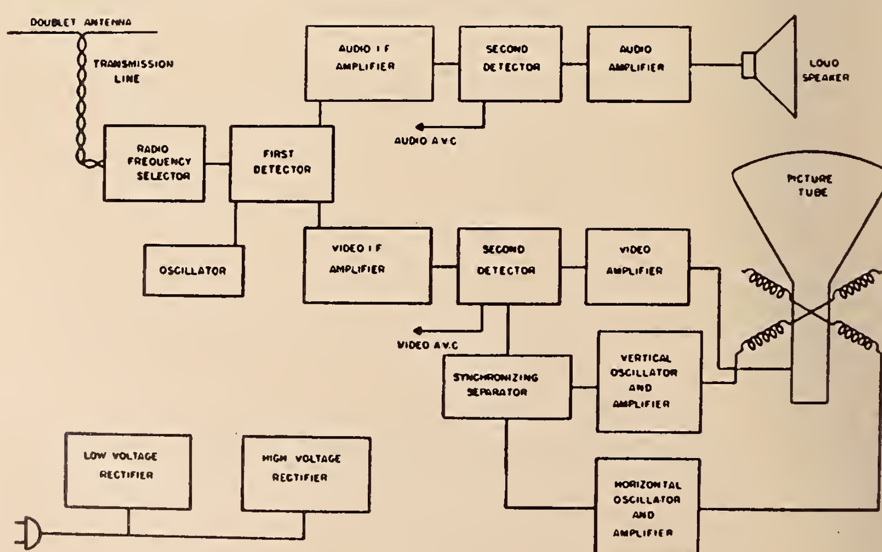


FIGURE 55. *Block diagram of typical television receiver*

FIGURE 56. ***Close-up of RCA television receiver showing all controls***

over again. Thus the beam is varied in intensity by the controlling grid current (actually the video signal), while it sweeps the screen so that it reproduces an image on the fluorescent screen, which remains there long enough for an entire frame to be reproduced before it decays, similar to the original image which was focused on the mosaic or photosensitive plate in the transmitter pick-up tube. Since 30 full images are reproduced each second, a person viewing the image on the screen receives the impression of a constantly moving picture.

In Figure 56 will be seen the seven controls in the front of a television receiver and the seven others located inside the console. The top, or the fluorescent screen, of the cathode ray tube can be easily seen both directly and through the mirror in the console lid. The controls on the front of the console are the ones which require adjustment. Those inside are to be adjusted at the time of installation and should not require further adjustment from then on.

Of the controls on the front, the top center one with the illuminated dial above it is the tuner control for both the video and sound signals. Since there is always to be a fixed relationship between the location of the video signal carrier and its accompanying sound signal carrier, the superhetrodyne receiver is designed so that both signals may be tuned in by a single control.

The three controls on the left, facing the receiver, are for adjusting the picture contrast, the picture detail, and the background brightness respectively. The three controls on the right are for adjusting the sound volume, the treble tone, and the bass tone respectively. The last, or bottom on the right, also turns the entire receiver on and off.

The controls inside the console, which the man shown in Figure 56 is adjusting, are for controlling the hold, centering, and width of the horizontal deflection respectively, the center one for focus, and the other three for controlling the hold, for centering, and the width of the vertical deflection.

A rear view of a television receiver of the console type with the guard cover removed is shown in Figure 57. The cathode ray tube in this case is mounted vertically inside the funnel shaped metallic shield. The picture and sound receivers are shown mounted at the front of the cabinet and the metallic boxes at the bottom contain the power supply and synchronizing units. Since a comparatively high voltage is required for the second anode of the cathode ray tube, a protective guard cover is placed over the rear of the cabinet. When this cover is removed, the high voltage is automatically cut off so that no one can receive a serious electrical shock by touching any circuits of the receiver carelessly.

One of the most important problems in connection with the television receiver is the antenna which must intercept the radio waves. In considering an antenna for a sound broadcast receiver, a simple wire of from a few to a hundred feet or more in length will suffice, provided that the received signal is sufficiently above the local and extraneous noise level. With a television receiver, however, the problem is more acute. This is due to the fact that an additional factor is intro-

(*Continued on page* 24)

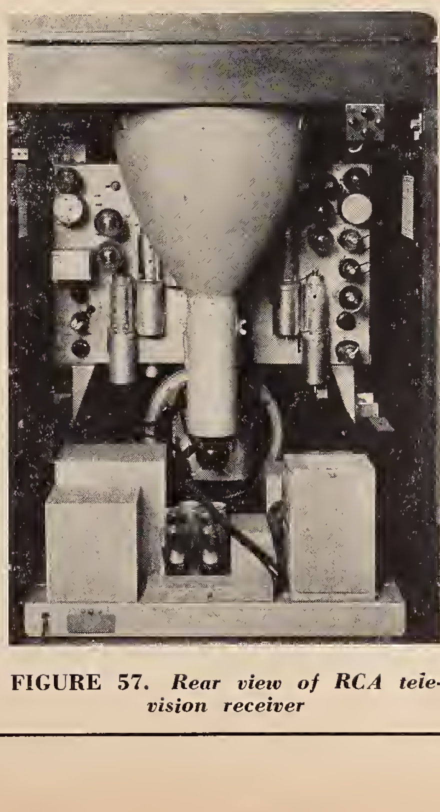


FIGURE 57. ***Rear view of RCA television receiver***

EDWARD BAUSCH, CHAIRMAN OF B. & L. DIES AT 89

On July 30 Edward Bausch, chairman of Bausch & Lomb Optical Company, a pioneer in the optical business of the United States, died at the age of 89 at his home in Rochester, N. Y. He was a son of John Jacob Bausch, one of the founders of the company.

Dr. Bausch entered the Bausch & Lomb business in 1874, and at the Philadelphia Centennial of 1876 his microscopes won first award for craftsmanship. Beginning in 1883, his activity in the development of the microscope and other laboratory instruments was evident in a succession of patents. Trichnoscopes, illuminators, microtomes, invertible microscopes, binocular microscopes, and centrifugal testing machines were followed in 1887 by his famous iris diaphragm shutter which made the snapshot camera a popular plaything. The improvement in photographic dry plates and lenses of higher speed occasioned a demand for a faster and better controlled exposure. The iris diaphragm shutter, a between-the-lens type, replaced the clumsy and inefficient shutters then in use.

In 1898 Dr. Bausch sponsored the publication of the Journal of Applied Microscopy, with articles contributed by some of the most distinguished scientists of the day.

The production and distribution of microscopes soon led to a host of complementary products, such as projection apparatus and cameras. In the latter part of the 19th century, the U. S. Navy, seeking a domestic source of supply for searchlight mirrors, turned to Dr. Bausch and his organization. He substituted parabolic curves on these mirrors for the old Mangin type and developed a new silvering process to withstand the heat.

Dr. Bausch was active in the planning and the expansion of the company for the present war until a year ago when illness curtailed his visits to the plant. However, he followed the progress of the company through the personal reports delivered to his home by company executives.

In 1936 Dr. Bausch received the gold medal of the American Society of Mechanical Engineers, "for meritorious mechanical developments in the field of optics," and in 1937 the parent chapter of Sigma XI, at Cornell, conferred upon him an alumni membership, one of five granted by this national scientific fraternity in fifteen years.

In 1940 Dr. and Mrs. Bausch presented their home and grounds as a gift to the city to provide a new home for the Rochester Museum of Arts and Sciences, and offered to build the first unit for the new home at their own expense. Upon acceptance of the gift, he began construction of the new unit.

RCA NET PROFIT FOR SIX MONTHS IS $4,440,214

Net profit for the first six months of 1944 of RCA was $4,440,214 after all charges and taxes, the company reports, a decrease of $478,580 from the $4,918,794 reported for the like 1943 period. The gross for the first six months of 1944 was $156,166,006, an increase of $15,164,640 more than the $141,001,366 reported for the first half of 1943. Tax provisions increased $85,850 over the 1943 figure of $14,204,800 to $14,290,650 for the first half of this year. Common stock earnings, after payment of preferred dividends were 20.6 cents in 1943 and 23.9 cents in 1944.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Notes on 16-mm Projection

Normally the source of light in a 16-mm projector comes from an incandescent lamp which is far from the ideal point source of light which the carbon arc gives. The filaments of these lamps are not in one plane, and, therefore, require a compromise in focusing and alignment. When dark or colored streaks appear on the screen, check the condensor and reflector adjustments. Fusing of the lamp envelope is ordinarily due to the simultaneous shutting off of the lamp and motor. To avoid this, first turn off the lamp for a few seconds before turning off the machine.

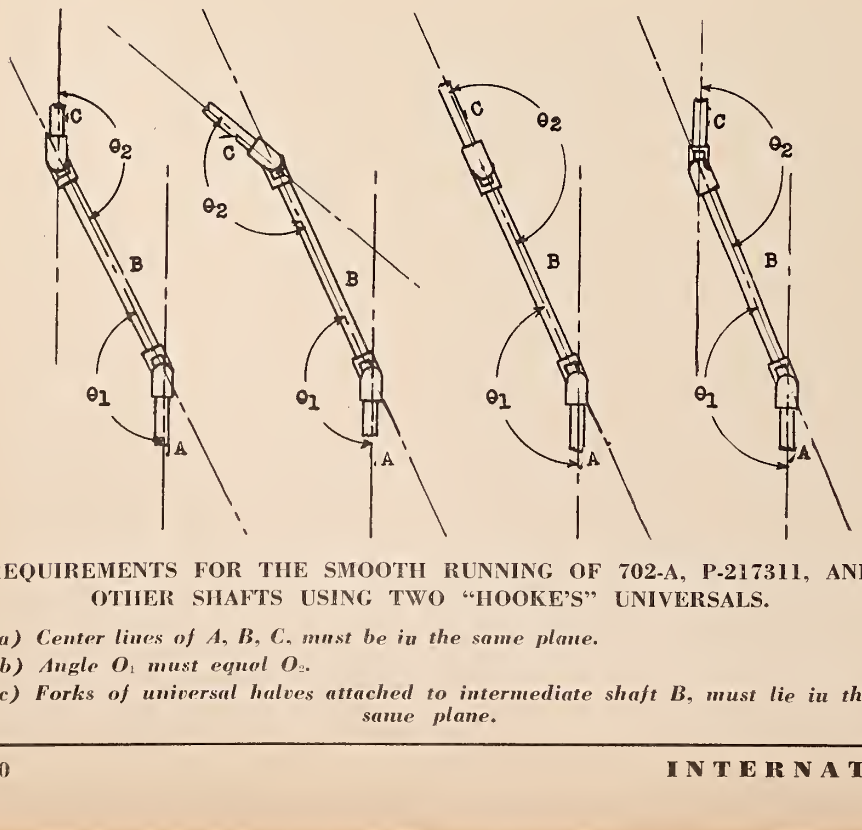
Film weave and sidesway in 16-mm projection is more difficult to cure than in 35-mm projection because of the single sprocket holes. Here is a pointer—be sure that the back plate and pressure shoe is not warped (use a magnifying glass and a good straightedge). Arrive at the proper balance between side or edge pressure and main shoe pressure. Safety or acetate base film warps much more than nitrate base stock—keep this fact in mind when observing out-of-focus effects which you may try to remedy with gate adjustments. Most 16-mm scanning is done by the "brute force" formula which transmits lower sprocket eccentricities faithfully to the scanning point. Remedy—get a true lower sprocket.—L. P. Work. Proj. Dept., *JAM HANDY.*

Correct Assembly and Alignment of Shafts Important

I had a case of severe machine vibration, and suspected the drive shaft was causing the trouble. I tried various angles for the universals but none would eliminate the trouble. I brushed up on couplings by reading "Kinematics of Machinery," by Albert and Rogers, and found that there are three requirements for the steady running of machinery through two Hooke's universals (see accompanying diagram). The requirements are necessary because a shaft driven through one (Hooke's) universal does not have a steady angular velocity—excepting shafts in line. *Complete compensation* is possible by using a second universal as shown in the diagram.

The advantage of correct assembly and alignment of shafts becomes greater as the operating angle of the universals increases. I have changed several equipments as indicated and the results have been favorable without exception.

It will be found necessary to file one new flat on many 702-A or P-217311 shafts in order to obtain correct assembly.—V. A. Carpenter, *ALTEC.*



REQUIREMENTS FOR THE SMOOTH RUNNING OF 702-A, P-217311, AND OTHER SHAFTS USING TWO "HOOKE'S" UNIVERSALS.

(a) Center lines of A, B, C, must be in the same plane.

(b) Angle θ_1 must equal θ_2.

(c) Forks of universal halves attached to intermediate shaft B, must lie in the same plane.

Conservation of 42-Type Tubes

The weak spare 42-type tube used in PG-105 and PG-138 equipments can be used in the MI-1228 monitor amplifier about six months longer after removal from the aforementioned systems.—M. F. Fritz. *RCA.*

Proper Procedure for Installing and Removing Power Unit Bulbs

On routine check-ups of supply units, I have come across a considerable number of rectifier bulbs that were damaged in careless handling. A stubborn bulb can be removed with ease by simply applying a side-to-side pressure on the bulb, at the same time turning the bulb out counterclockwise. When installing a new bulb, put just enough pressure on the belly part so that your fingers will slip over the bulb when inserting into the socket, again applying the side-to-side pressure and turning in a clockwise direction. The reason for this procedure, which not only insures proper contact for the bulb but also prevents damage, is obvious. The coarse thread of the bulb base as well as the socket does not permit a tight fit, hence the side-to-side motion which centers the screw base into the socket.—Nat Ripp, *RCA.*

Modification of Erpi 42-A Amplifier

In modifying an Erpi 42-A amplifier for increased power by installing 2A3 tubes, I used only one-half of the filament transformer which has an output of 2.2 volts. This eliminates the stock ¤28096 resistor. A complete check on the

(Continued on page 29)

Proper Fusing in the Projection Room

By *HENRY B. SELLWOOD*

THE FUSE is one of the few vital parts in a projection room that can *never* be tested. There is no way to test it. The important point about a 20-ampere fuse is, will it burn out at 20 amperes? If the test is made and it does—then it *was* a good fuse; but it was destroyed by being tested. In other words, the projectionist cannot test a fuse. Neither can the factory that made it.

For this reason alone it is not possible to assume that a fuse will burn out at precisely the current for which it is rated. Some tolerance must be left for slight inaccuracies in the rating.

An additional reason for tolerance in fusing is that what actually destroys the fuse is not current, but heat. The current heats the fuse wire, and the heat, when it becomes sufficiently great, causes the wire to melt. The surrounding temperature will have some bearing on the exact point at which the fuse gives way. If, for example, it is located inside an amplifier that runs pretty hot, it may burn out at somewhat less current than otherwise.

Still further, fuses are made for every possible value of current. Among the most common ratings, as is generally known, are 3, 5, 8, 10. 15 amperes, etc. These satisfactorily serve all purposes but once again, it is necessary to leave some tolerance, and fuse an 11-ampere circuit at 15 amperes, not at 13 or 14 amperes. There aren't any 13 or 14 ampere fuses.

The necessity for leaving tolerances, and sometimes pretty wide ones, in fusing a circuit, tends to produce some carelessness in the choice of fuses; and that carelessness results not only in trouble but sometimes in apparent "miracles."

The rather widespread impression that fusing isn't really a critical matter anyhow, and requires no particular calculation, is completely wrong, as will be pointed out further in this article.

Diagrams Needed

A second cause for troubles and "miracles" in connection with fusing lies in failure to consider *all* the circuits related to the same power board when a fuse is inserted in one circuit. Very often this neglect is not in the least the fault of the projectionist. If there is no diagram or chart in the switchboard, or if the diagram is wrong, as it often is, the projectionist can't possibly know what he's doing. In that case it is up to the management to pay for enough overtime to allow the projectionist to make a wiring diagram of the power circuits.

A sample diagram is shown in Figure 1. Let us assume that the fusing there shown is correct—that the projector motor fusing is high enough to allow for the motor starting current, and so on—and it is not difficult to see why the entire circuit of that switchboard, as drawn, must be known to the projectionist before he can fuse any one line with reasonable accuracy.

Suppose for example that arc supply rectifier No. 1 develops some trouble and its fuses (in the switchboard) burn out. Suppose further that those fuses have become discolored with time or have lost the paper wrapper that carries the rating information, both of which often happen. Suppose still further that 30-ampere fuses are substituted in this circuit.

Then the new fuses will have a current capacity of 15 amperes above the normal current of the line they protect. But the maximum possible normal current of the entire switchboard is 15 plus 15 plus 10 plus 10, plus 3 plus 3, or 56 amperes, and the main switchboard fuses have a current capacity only 4 amperes higher than their possible maximum of normal current.

Which is likely to burn out first, if rectifier No. 1 develops trouble again—the rectifier fuses with a 15-ampere margin or the main fuses with only a 4-ampere margin?

Here then is opportunity for one of those mysterious and miraculous happenings in which the trouble sometimes "jumps" the nearer fuse of lower rating to burn out another and larger fuse farther back toward the source of power.

The only reason for considering such occurrences mysterious is that the projectionist very often does not have before him the whole picture, as it is shown in Figure 1. He knows only that the same rectifier was supplied through 30 ampere fuses and 60 ampere fuses in series, and that the 30 ampere fuses held while the 60 ampere fuses burnt out. Of course there isn't any accounting for a thing like that while the full complexity of the power wiring is unknown.

Up to this point it has been assumed that 30 ampere fuses were substituted for the 20 ampere fuses shown in Figure 1, and that that drawing as it actually appears is correctly fused. But it is not.

The greatest possible normal current through the switchboard is, as noted, 56 amperes, leaving a 4-ampere margin at the main fuses. But each set of rectifier fuses, even at 20 amperes as drawn, has a 5-ampere margin. Figure 1 is not correctly fused. If either of those rectifiers develops trouble, the chances are that both the 20 ampere fuses and the 60 ampere main fuses will burn out simultaneously.

Then again let us suppose that there is some reason to use a soldering iron in

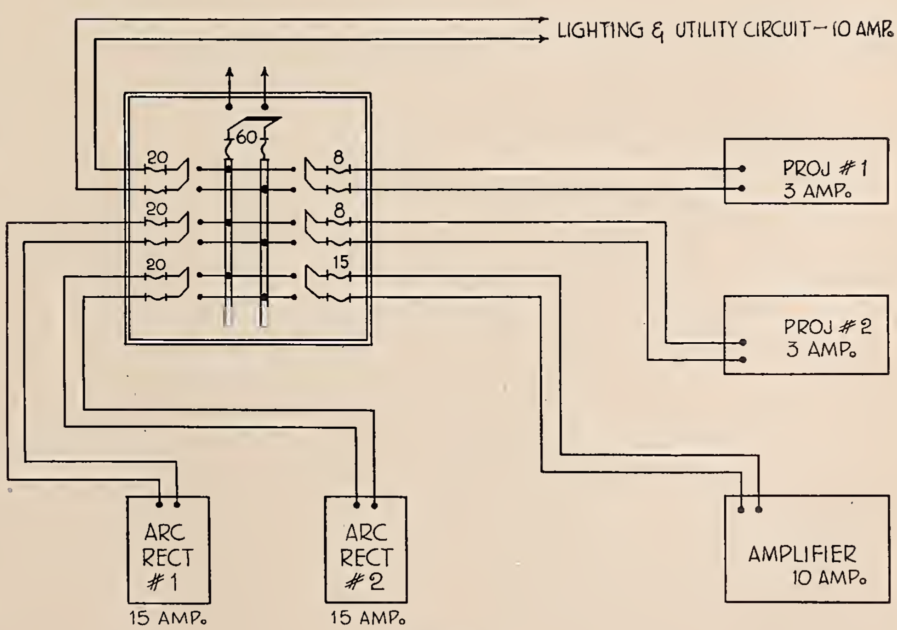


FIGURE 1

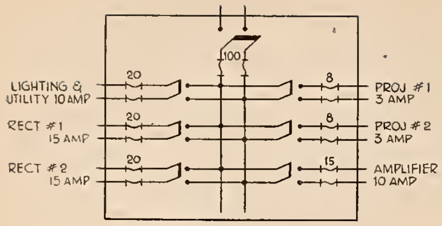


FIGURE 2

the projection room, and it is plugged in to the "lighting and utility circuit." The projectionist may note that that circuit normally carries 10 amperes but is fused for 20 amperes, therefore it seems safe enough to plug a 5 ampere soldering iron to it. But if there is only a 4 ampere margin at main fuses of the switchboard, the 5 ampere iron will burn out those fuses. while leaving the 20 ampere line fuses unharmed.

Still another factor to be considered in connection with fusing is that the starting current of a motor is higher, and may be very much higher, than the normal running current. The 3-ampere motors shown in Figure 1 may possibly draw 7 amperes momentary starting current. This would bring the momentary drain through the switchboard to 60 amperes at each changeover—provided the lighting and utility line were utilizing its normal 10 amperes. At times when there was less than the full 10-ampere drain on the utility line, operation would proceed normally; but sometimes, with the utility line carrying its full current, the main switchboard fuses might give way. Another of those mysterious troubles that happen only occasionally and "can't be explained."

And in fact they cannot be explained unless all the details of the power wiring are known.

Main Fuse Troubles

If the switchboard main fuses in Figure 1 break down, the lighting line will cease to function, and unless there is a second and independent source of light the projectionist will have to look for his trouble in the dark. Even if he does have light, he will not know, by the symptoms of the fuse outage, which of the six circuits supplied by those fuses is the cause of his difficulty. The audience will have to wait while he investigates six circuits, instead of one.

Or suppose one of the rectifiers develops a fault. In installations such as here shown, there often is a changeover switch wherehy either arc can be supplied from either rectifier. If one rectifier fails and burns out its own line fuses, a flip of a switch will restore the show for the remainder of the reel, and the projectionist may be able to complete repairs with no further inconvenience to the audience.

But with incorrect fusing, as shown in Figure 1. the chances are the main fuses will go, and both rectifiers will become inoperative. So will the amplifier and the projector motor and the projection room lights.

These difficulties by no means exhaust the complications that may and do result from improper fusing. In this diagram, the 60 ampere main line fuses are shown within the projection room switchboard. But troubles of the type just described may not blow out those fuses at all. Somewhere outside the projection room there will be another and larger switchboard, one that supplies the projection room switchboard—and perhaps supplies the theatre lighting circuits, or the air conditioning equipment. Finally, somewhere in the cellar there will be the meter fuses.

Improper fusing can result (on the principles just outlined) in a projection room trouhle burning out fuses in a distant switchboard or even at the meter board. The reverse can also happen, in that a fault in the theatre lighting circuit, etc., may remove all power from the projection room—but that is not the responsibility of the projectionist.

What is within his responsibility is the fusing in the projection room, with the full understanding that a mistake there may be reflected not only at the main fuses of Figure 1, but may burn out distant fuses on the theatre's panel board located elsewhere. In other words, merely putting larger fuses in the main line of Figure 1 is no automatic cure-all for the conditions previously outlined. Doing that may darken the entire theatre.

Causes of Poor Fusing

A prime cause of poor fusing is lack of detailed knowledge of the power circuits involved. In most theatres, the projecionist need only know the wiring of his own dominion. The house electrician or some similar employee will specify the largest size fuses that can be used with safety in the main line of such a board as Figure 1. The projectionist will then have to make the wiring of that board conform to the maximum possible fusing of the main line.

In Figure 1, if 60 amperes is really the limit for main line fuses, the power board is overloaded, and some of the load should be transferred to other circuits. Such conditions arise through installation of new apparatus from time to time, without proper regard for the limitations of the power supply.

But even when the power supply is entirely adequate, new apparatus may be installed without any effort to note the corresponding changes in wiring on the power switchboard schematic or chart. Thus it happens in many theatres that the schematic which may originally have been supplied with the switchboard becomes obsolete and altogether meaningless.

Sometimes there is no schematic or chart of the power board at all. There never was one, or it has become lost.

Whenever complete power circuit information is not at hand, the projectionist does his fusing in ignorance, and almost anything can happen.

In all such cases proper operation, proper care of equipment, and the continuity of the show, require that the necessary information be compiled. Power circuits must be traced through completely and in full detail, and a drawing made along the lines of Figure 1. A chart, along the lines of Figure 2, will serve equally well. Note that Figure 2 shows both the actual drain of each line, and the proper size fuse for that line.

Neither chart nor diagram can be effectively made during the show. The wiring is best traced after hours, and whatever overtime has to be paid is valuable insurance.

A second cause of poor fusing is lack of a *large* supply of every size fuse needed. When trouble causes a fuse to burn out, the work of fixing the trouble may involve burning out several more fuses. This does not happen, of course, when the nature of the difficulty is ob-

(*Continued on page* 26)

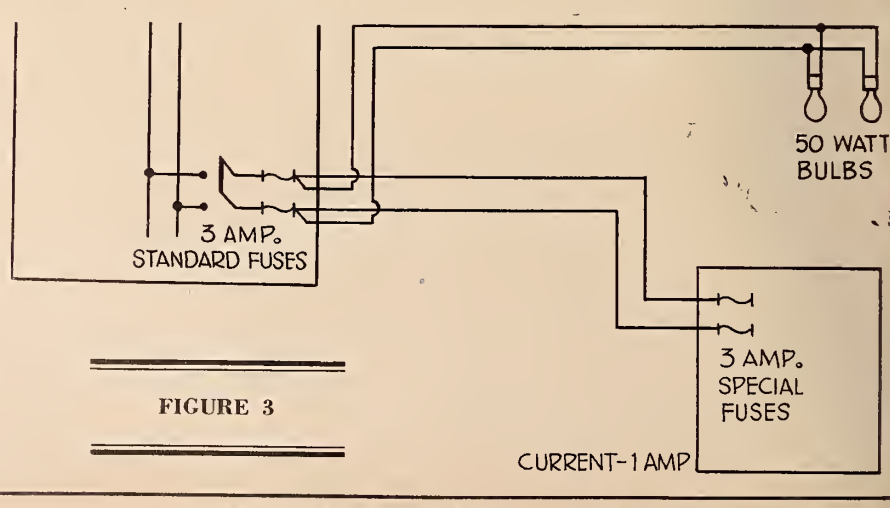


FIGURE 3

PARAMOUNT PROJ. EQUIP.

(*Continued from page 8*)

nified picture is at the end of an optical "lever-arm" 100 feet or more in length, and any irregularity in film registration and the like in the original negative or in the positive "plates" passing through the projector will be disproportionately enlarged on the screen. Irregularities in motion will show up strongly in comparison with the steadiness of the actual foreground pieces and action. With the foreground steady, and the projected background portion of the scene unsteady, all illusion of reality would be lost in the composite scene.

The convenience and precision of operating the new units should not be overlooked. The design has been such as to provide, as nearly as possible, foolproof, and in some instances, automatic operation. Synchronism of camera and projector, for instance, is automatically assured. Focusing is effected by remote control, from the camera position. The projector may be panned and tilted with the freedom of a camera, and with perfect precision.

Where hitherto most background projectors have been at least as noisy as the average theatre projector, and necessarily had to be operated only from within a bulky, sound-proof booth, the new units have been silenced to a degree comparable to that of a modern, blimped studio camera. Taking noise measurements at the usual 45-degree positions about the projector, at a distance of 6 feet, and using a meter with a 40-db ear loudness weighting characteristic, and calibrated with respect to the standard reference level of 10^{-16} watt per sq-cm, the noise level of these new machines is below 34 db.

These are not mere conveniences in operation. They add very measurably to the productive capacity of the machines. With the earlier transparency process projectors, with their less convenient controls and the greater bulk and complication due to the large sound-proof booths, one could not work very fast. The new projectors can be worked with the speed and facility of studio cameras.

B. F. SHEARER CO. SIGNS CONTRACT WITH MOTIOGRAPH

B. F. Shearer Co., which maintains theatre supply stores in Los Angeles and San Francisco, Cal., Seattle, Wash., and Portland, Ore., has signed a long term contract with Motiograph for exclusive distribution of Motiograph projectors and Motiograph-Mirrophonic sound systems on the entire West Coast and the Territories of Hawaii and Alaska.

• BUY WAR BONDS •

Presenting: B. I. Steinmetz

B. I. (BRUCE) STEINMETZ, president for the past seven years of Local No. 213, Great Falls, Montana, was born to the theatre and to the labor movement. The lure of the tinsel and bright lights carried him as a boy into show business, his first step in that direction being as usher in the Columbia Theatre, St. Louis. From that job it was but a step to the road, working in show business in season and, to provide the necessaries for cakes and coffee, a laundry job in the off-season.

His entrance into the movie world, when the shadow screen began to make itself evident in the early 1900's, was via the road of singing to illustrated songs. At that time the projectionist looked like a pretty important man to young Steinmetz and he did a little cultivating of that individual. In time he found himself running the machine, placing the slides and singing his songs—all from a dry goods box set up at the rear of the theatre.

The call of the West was answered by Steinmetz in 1908, at which time he became a singing theatre manager. He finally dropped his vocalizing and stepped up from theatre manager to film exchange manager. As such he went through the reorganization period of General Film, Universal, Warners, Vitagraph, Famous Players and the various other companies that were struggling to book feature pictures of five thousand feet in houses that had to pay or play their regular program pictures. While managing a film exchange for Sol Lesser he joined Local No. 159, Portland, Ore.

Great Falls, Montana, had appealed to Steinmetz in his travels, and in 1917 he settled there, transferring his membership to the Great Falls I. A. Local No. 213. Shortly after becoming a member of the local he was elected treasurer. He later was elected president of the local and a delegate to the Central Labor Council. In the late 1920's he became active in the C. L. C., and several years later in recognition of his devoted service to the organized labor movement in Montana, he was elected president, an office he has held ever since.

Steinmetz's hobbies used to be big game hunting and fishing but union affairs during recent years have made it practically impossible for him to indulge in them. His actual hobby is the defense of the ideals and principles of organized labor, and when the legislature is in session he lobbies for or against bills related to labor.

In addition to being president of I. A. Local No. 213 and the Central Labor Council, Steinmetz is a member of the City Post-War Planning Commission, a member of the Administrative Committee of the C. E. D., a Minute Man of the Treasury Department, a member of the executive committee of the County War Finance Committee, a panel member of the War Labor Board, member of the local chapter of the National Foundation, member of the Advisory Council of the Unemployment Compensation Commission, a past director of WPA, and a past member of various relief agencies.

He has a personal acquaintanceship with the political leaders of his state and enjoys the distinction of having played an important part in the many labor bills inaugurated in the state of Montana.

(This is another in our series of who's who in the projection world. From time to time I. P. will present to its readers brief word portraits of leading figures in the craft.—Ed.)

TELEVISION TODAY

(Continued from page 19)

duced in visual reception not present in sound broadcasting. This factor is that any reflected waves which may have travelled a few hundred feet more than the direct waves must not be allowed to enter the receiver. Several years of experiments indicate that this can be done in most cases.

When reproducing a 525-line picture with a repetition rate of 30 pictures per second, the cathode ray spot travels across the fluorescent screen of a 12 inch receiver tube at a speed of about 2½ miles per second. This is 1/75,000 times the speed of light or radio waves in free space (186,000 miles per second). Thus the spot will move about 0.060 inches while a radio wave is travelling 400 feet. Therefore, if both a direct and reflected wave arrive with comparable magnitude at the input terminals of a television receiver, and one has travelled 400 feet further than the other, a double image will result. The displacement of the two images in such an event will be about 1/16 inch and will cause blurring of all vertical lines in the picture. Many types of distortion may result from such a condition.

Thus it is apparent that the antenna must supply a television receiver with one signal only from a desired transmission. In metropolitan areas, reflections from large buildings may give rise to several images and the problem of proper construction, location and orientation of the receiving antenna becomes extremely important. However, at any location by some trial and error arrangement, satisfactory results may be achieved.

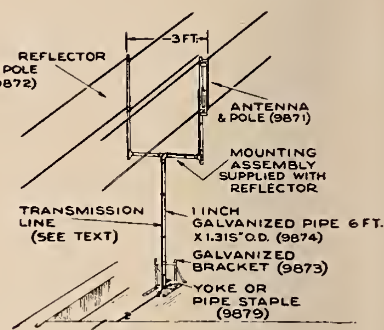


FIGURE 58. ***RCA double dipole television receiving antenna***

Probably the most generally useful type of television receiving antenna will be a simple dipole or double dipole, as shown in Figure 58, connected to the receiver by means of a low impedance, twisted pair transmission line. Transmission lines from the antenna to the receiver are most important. In some cases, the line must be properly balanced and terminated at the receiver. At the majority of receiving locations this undoubtedly will give completely satisfactory reception if normal care and thought are used in its installation.

Even at many places where multiple-path reception is encountered, the same type of antenna may be made to serve satisfactorily by orientation to minimize the reflected signal, or by shielding it from the reflecting surface. If, however, several strong reflected signals are present at the receiving location more drastic action will probably be necessary. This is a problem for the receiver installation engineer.

PERSONAL NOTES FROM RCA

Homer B. Snook, sales manager of RCA's Theatre Equipment Section, has returned from the middle west where he visited the theatre supply firm of Joe Goldberg, Inc., in Chicago. He also spent several days in Detroit with Karl Brenkert, president of the Brenkert Light and Projection Co. H. J. Benham has returned to Camden headquarters from a trip to the Chicago and Milwaukee districts. Adolph Goodman, assistant manager of the RCA Service Company, is back at headquarters after a trip to Chicago. John F. O'Brien, assistant sales manager of the Theatre Equipment Section and Adolph Goodman, manager, recently visited the RCA Laboratories in Princeton, N. J.

SCHEMATICS

(*Continued from page* 14)

so on. There will then be five steps: (1) make the layout—the equivalent of Figure 2; (2) add terminals and connection points where needed—and only where needed for clarity; (3) add apparatus information; (4) draw in wires, and (5) add wire information.

Figure 4 is the wiring diagram of the apparatus mounted on the back of the panel of Figures 2 and 3. Since the back and front of the panel cannot be shown in the same drawing, two separate drawings are needed.

Note that in Figure 3 the path of the wires is *not* shown, while in Figure 4 each wire is traced throughout. Either method can be used in a wiring diagram. To draw in every wire, as is done in Figure 4, makes large and complex drawings crowded, and often clumsy and hard to read. Draftsmen increasingly favor the method of Figure 3.

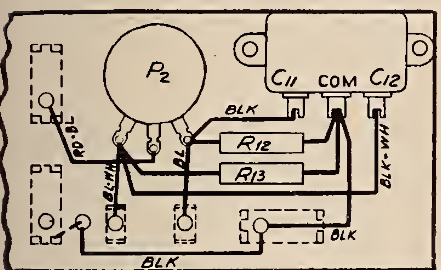


FIGURE 4

The information found in Figure 4, such as P-2, C-11, R-12, may present the projectionist with a problem. If such information is stenciled on the parts, it should by all means be used. If the stencil marks have been obscured by dirt, clean them with a dry rag. Beware of either water or carbon tet—the markings may wash off. Use a cleaning fluid of any kind only after the dry rag has hopelessly failed and there is nothing to lose. Then use it very sparingly, rubbing gently in the hope that perhaps the dirt will come off without taking the markings with it.

If such information as P-2, C-11, R-12, etc., is not found on the apparatus, then the projectionist should provide it himself, numbering all parts according to any code he pleases. The purpose of these numbers is only identification; hence the code used does not matter. When the schematic diagram has been completed, R-1 in the schematic will be the same part as R-1 in the wiring diagram, and the same part as R-1 in the apparatus. The identification is the important thing. If the projectionist wants to call the part 100-X instead of R-1, that makes no difference, so long as it can be identified.

It is customary, however, to use *R* for resistors. *C* for condensers, *L* for inductive windings of any kind except transformers; *T* for transformers, *TS* for terminal strip, *V* or *VT* for tubes (meaning vacuum tube, but often used even if the tube is of gas-filled type), *P* for potentiometer, *S* for switch, *J* for jack, and so on. (Remember that *V* is used for tubes. and therefore not for volume controls. The latter is designated either *P* or *R*—potentiometer or resistor.)

Further details of the practical work of making both wiring and schematic diagrams will be taken up in future articles to appear in I.P. from time to time.

PROPER FUSING

(*Continued from page 22*)

vious, but often it is necessary to make some adjustment, put in a new fuse, and "see what happens." This may have to be done a number of times before some troubles are traced to their ultimate hiding place. If the supply of fuses of every size is not generous, it may become necessary to substitute fuses of the next larger rating—as substituting 30 ampere fuses for 20 ampere fuses in Figure 1. By the time a new supply of 20 ampere fuses arrives, the substitution has been forgotten, or the projectionist who knows about the substitution isn't working that day. Later, when one of the more serious consequences of overfusing turns up, everybody is surprised to learn that such and such line was overfused, no one knows by whom, no one knows how long ago.

The remedy is simple—try to make sure that every type of fuse used anywhere in the projection room is present in the spare parts box in generous quantities. And order replacements far in advance.

A third cause of poor fusing is keeping the supply of fuses in an out-of-the-way place; especially, keeping them where relief men can't find them. So far as possible, it is good practice to keep a generous supply of each type inside every switchboard or panel in which they are used.

A fourth cause of poor fusing is plain carelessness. The projectionist may have all the information necessary, a complete duplicate of Figure 1 applying to every detail of his projection room, and simply not trouble to perform the easy act of adding up amperages. But that's the rare case. It's easier to add a few figures than to change a fuse. If the projectionist has the information he'll do the adding. Lack of information is the primary cause of fuse trouble.

Some amplifiers and other forms of equipment are fitted with fuses of special types which may not be easily available in wartime. Some "midget" fuses are very scarce in some cities. A simple trick that will prolong the life of such fuses is diagrammed in Figure 3.

The additional 1 ampere load placed on the switchboard fuses (by wiring in the two 50-watt bulbs) means that the 3 ampere fuses in the switchboard have only 1 ampere margin of safety, whereas the special fuses in the apparatus panel have a 2 ampere margin. In case of any trouble in the apparatus, unless it is a very heavy short, the chances are that the switchboard fuses, which are of standard type, will burn out first, and the special fuses in the apparatus panel will thereby be protected.

Many variations of this simple arrangement will readily suggest themselves. A useful 1 ampere circuit, which has to be supplied with current anyhow, may be substituted for the lamp bulbs of Figure 3. If that is done, however, it is necessary to make sure that this branch circuit will always and invariably be functioning when the apparatus panel is in use; if such is not the case, there will be times when the special fuses of the apparatus will be without protection.

Some Practical Rules

1. Find out the current requirements of every piece of apparatus supplied by the panel board. This will almost always be shown on the name plate of the apparatus. If it is not, inquire of the manufacturer or use an ammeter.

2. In connection with the above, make allowance for the *starting* current of motors, which can be very drastically higher than the operating current. It is not usually shown on the name plate. Therefore consult the manufacturer's fusing instructions, or use an ammeter.

3. If an ammeter is not available (many theatres powered by a.c. do not have a.c. ammeters) experimental fusing and re-fusing (out of show hours) will afford a reasonably accurate indication.

4. Allow some tolerance in fusing. Fuse each line—each branch circuit of Figure 1—at very roughly not higher than 125 per cent its normal maximum current.

5. Assume that *all* branch circuits connected to a given panel board overload simultaneously just as far as they can without burning out their own circuit fuses. Add the amperages of all branch circuits, assuming such simulta-

neous overload, and insert main fuses (as at top of Figure 2) with a rating of roughly not more than 125 percent the total amperage thus calculated.

6. Check with the theatre electrician, or with the power company, to make sure the main fuse rating, determined as above, is *safe*—that it will not involve risk of blowing some other fuse at a theatre distribution board or at the meter board. Where such risk exists, transfer some circuits to another projection room panel board, and then recalculate all fusing as above. If there is no other projection room board, arrange to have an additional board and power line installed. Accurate addition of fusing requirements, as above, will readily demonstrate the necessity for this measure wherever such necessity exists.

7. Keep on hand an *ample* stock of fuses ef every type and rating used.

8. Keep these spare fuses where they can be found without difficulty by anyone concerned, including the newest relief projectionist.

ALTEC APPOINTS W. E. GREGORY SEATTLE DISTRICT MANAGER

Altec Service Corporation announces the appointment of W. E. (Jack) Gregory as their Seattle district manager, replacing Barclay Ardell who has resigned from the company as of July 31st. Mr. Gregory has been associated with Altec since its inception in various managerial capacities in the midwest area where he has many friends among theatre owners and personnel.

• BUY WAR BONDS •

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LETTERS TO THE EDITOR

Army Projection Below Par

To the Editor of I. P.:

Perhaps you have forgotten me or my name, but your letter of December 16, 1943, has pursued me from one army camp to another throughout the United States and overseas until it finally caught up with me here "somewhere in India." In view of the fact that your letter crossed the United States twice, covering some 12,000 miles, and traveled an additional 18,000 miles overseas, prompts me to answer it immediately.

I am not in a position to discuss my duties for that is a matter strictly between Uncle Sam and myself—all I can say is that I have done and am still doing plenty of traveling.

You asked me about projection in the army. Well, I have witnessed G. I. shows in South America, Africa, Arabia, and in various parts of India and in every instance the result was the same—"lousy," and this despite the best built American 16-mm equipment. The reason for this is pretty obvious—the Army insists upon making projectionists out of blacksmiths and butchers after only one week's training. Every professional projectionist knows that it just doesn't work out that way—it takes more than a week or two of training to run a projection machine. In the Army, however, that fact is not recognized and the highly specialized services of hundreds of I. A. projectionists in the service are wasted. The American movie-going public is accustomed to good projection and you should hear the thousands of G. I.'s squawk about the poor shows put on here.

Enclosed is a five rupee note for the renewal of my subscription. (I have forgotten the subscription price and if the amount is not sufficient, please let me know and I will send you the difference.) Also, will you send the magazine to me here in India instead of my home in California—in the helter-skelter of moving around the world I haven't seen a copy of I. P. since the January 1944 issue. Thanks a lot.

CPL. RAY KIRKPATRICK,
L. U. 340, *Eureka, Calif.*

A Puzzled Projectionist

To the Editor of I. P.:

Greetings! Perhaps you can answer a question that has me baffled and no doubt is puzzling many of your projectionist readers. Immediately after the declaration of war, the projectionists throughout the country were urged to save carbon drippings, carbon stubs, and were taught how to peel the copper off carbons—all for the purpose of aiding the government overcome the critical copper shortage.

I, for one, faithfully heeded this request and at the present time have an accumulation of carbon drippings, and carbon stubs, packed in boxes, paper bags, etc., that is overflowing my projection room. This probably is true of thousands of projection rooms all over the country. What are we to do with these collections? The managers don't know, the union officials don't know, and we, the projectionists, don't know.

Who the hell does know—do you?

GEORGE L. MONSIVE,
L. U. 604, *Oakland, Calif.*

If Brother Monsive will refer to the National Carbon Company advertisement that appears elsewhere in this issue, he will have an answer to his question.—ED.

A Boost for I. P.

To the Editor of I. P.:

I am enclosing herewith money order for $3.00 in payment for a two-years' subscription to I. P. to be sent to

Cpl. John Thomas Thorman, 39030263
APO 16121 A, c/o P. M.
New York, N .Y.

Corporal Thorman writes that the only thing he misses since leaving the States is the "Projectionist." That is quite a boost for your magazine.

Kindest regards,

FLOYD M. BILLINGSLEY,
Bus. Agt., L. 162,
San Francisco, Calif.

IN THE SPOTLIGHT

(*Continued from page* 17)

turn home, Gus, and we sincerely hope it won't be long when all our boys will come marching home.

● The name of Stan Creech, member of Local 348, Vancouver, Canada, occasionally crops onto these pages. Stan is a member of the Royal Canadian Navy and has been on convoy duty for the past few years, sometimes stopping at New York between trips. We plan to corner him one day after the war and have him relate to us some of his thrilling experiences encountered while on convoy duty. Incidentally, when we saw him a few days ago, he asked us to advise Hank Leslie, his local secretary, that one of his shipmates is a chap by the name of Don Thompson, a neighbor of Hank's.

● Moorman H. Snow, for many years an officer of Local No. 305, Galveston, Texas, has been made a life member of his local. Snow sufficiently recovered from an injury he suffered last spring to attend the convention, looking pretty fit. He is one of the new 25-30 Club members.

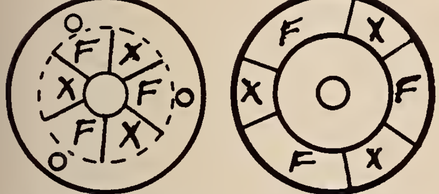
AT YOUR SERVICE

(*Continued from page 20*)

unit was made and satisfactory results were obtained. Power output 9 watts. A stock #26964 1000-ohm resistor was connected in series with the original R2, 575-ohm resistor and adjusted to give 925 ohms. In order to increase the plate voltage on the 2A3 tubes, a new wire was run from terminal 2 of L2 to plus of the plate milliameter.—G. P. KNAPP, *RCA*.

Improving Take-ups

Many of the take-ups in use today are being used for purposes for which they were not designed. On the W. E. system which was designed when sound first came out, the friction disc, made of fibre, had a hard, smooth surface. This meant a large area. Due to warpage, this was changed to leather, which has several times the traction the fibre disc had but nothing was done to compensate for it. The spring has to run at the point of collapse and then it pulls too tight. As we get clutch action from spring tension and friction, it is ridiculous to use a large area with no spring tension. In other words, all of one and none of the other. But by cutting out



W. E. TAKE-UP **SIMPLEX**

Cut out areas marked X. Friction areas marked F.

60% of this area and using some spring tension, we will be using a little of each. It then will be possible to take up a full reel without having the spring at point of collapse.

The lower reel can be stopped for a second and when the reel catches up the sprocket holes are still in the film. The take-up should be softer than the film (if the take-up won't give, the film will).

On belt driven take-ups, two turns tension will take a reel but the spring will fail. To prevent this, the nut is tightened four turns and now it is too tight. The belt is then allowed to slip and does the work supposed to be done by the take-up. Loose belts make poor clutches as we do not have a uniform load in the lower magazine. This, too, is hard on take-up sprockets. One of the most popular clutches was designed for leather but for 60 r.p.m. and with a different pulley ratio.

On the Powers take-up I cut the red fibre friction disc in quarters and use a quarter on each side. There are two ways to cut friction area. One is to reduce the diameter of the disc, but this only reduces area. A better method is to cut out sections. This not only reduces area but at the same time breaks up vacuum and the edges of the slots act as oil scrapers and keep a uniform amount of oil on the pulley. (Automobiles never worked with a one-piece clutch).—R. O'TOOLE, *RCA*.

Correcting Rectifier Trouble

Newly installed and properly heated 866 rectifier tubes worked okay for a period and then the plate fuse blew and the high voltage plate transformer arced over at the terminals. This occurred several times before the cause was detected. The filament voltage at the terminals of the 866 sockets measured properly but the terminals were found dirty underneath even though the screws were tight. The trouble was eliminated when the terminals were cleaned. With oxide coated filaments the proper temperature of the rectifiers is hard to detect by observing the brilliancy of the filaments. Tubes rejected from this amplifier worked satisfactorily after the cleaning process.—C. S. SCHWANDER, *RCA*.

Emergency Use of Socket Selector

In an emergency, the Weston Socket Selector Unit may be used to adapt a tube to a socket which has the proper voltages for the tube but not the proper socket. Insert the proper plug in the amplifier,

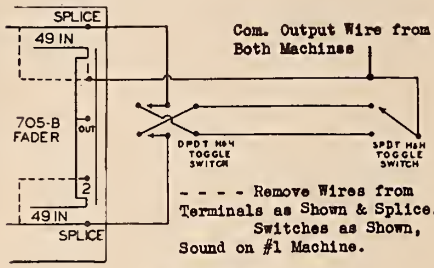
(*Continued on next page*)

(Continued from preceding page)

and the new tube that is to be used should be inserted into the Weston test block. Connections are then patched with test leads at the block to place the proper voltage on the tube being adapted. Thus, an 80-type tube may be substituted for a 5Y3, 5Z3 for a 5U4G, and vice versa. Although I have not tried it out, substitutions for driver and output tubes probably could be made in the same manner without too much pickup in the test cable.—R. S. Sear, *RCA.*

Changeover Arrangement for 705 Faders

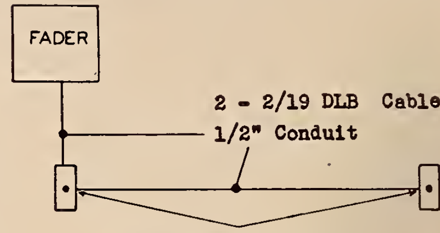
Occasionally I receive requests from projectionists to either change their faders, where a single 705-type is used, or to make some arrangement so that sound changeover may be made from either machine. I have installed the switches, shown in the sketches below, at six theatres, and today after six months



SCHEMATIC

operation, they are still working satisfactorily. There is no click or hum during changeover and the projectionist can go from one machine to another without any loss of sound.

You will note that only one side of the fader is used for level from either machine. These switches may be used with



CONDUIT LAYOUT

any type of fader. For best results, however, the Yaxley type is suggested. In one theatre I installed the switches in connection with a 702-type fader. Sound changeover may be made at either machine, from either machine. — A. D. Brooks, *ALTEC.*

WPB ASSURES OWNERS ON EQUIPMENT SUPPLIES

Recognizing the important contribution by motion picture theatres in assisting government information programs, sale of war bonds, and in providing recreation for war workers, the War Production Board will make every effort to provide existing theatres with necessary operating equipment, William Y. Elliott, vice-chairman for civilian requirements of WPB, said before a meeting of the newly organized Theatre Owners Industry Advisory Committee in Washington. He added that construction of new houses will continue to be severely limited.

Mr. Elliott declared that the erection of new theatres will be permitted only when WPB is convinced that a new house is absolutely essential in the community. He urged that theatres expand their present services to the public whenever necessary by increasing hours of operation and by other methods.

Donald R. Longman, government presiding officer, discussed the new criteria for handling of applications to WPB for additional facilities. They have been evolved, be said, to guide WPB in determining whether any new theatre should be built.

Committee members approved the proposed criteria but recommended that, before any new theatre construction is approved, the existing operators in the particular community be consulted on the needs for a new movie house.

Repair parts for projection and sound equipment are being provided in sufficient quantities to keep existing equipment operating, committee members said. No restrictions have been placed on the manufacture or distribution of these parts. Production of repair parts has increased, WPB said, because the lack of new equipment has made it necessary for theatre operators to repair equipment that they would ordinarily replace.

Back Copies I. P. Needed

The library of a large research organization is urgently in need of copies of the November and December 1943 issues of INTERNATIONAL PROJECTIONIST. Any of our readers who have either or both of these copies to spare may forward them direct to I. P., and any expense incurred thereby will be promptly refunded.

INTERNATIONAL PROJECTIONIST

SEPTEMBER 1944

VOLUME 19 • NUMBER 9

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What goes on in there?

TO the industry, this building—our Hollywood laboratory—brings to mind the peacetime work carried on there for the improvement of sound in motion pictures. Behind its doors today, engineers of the Electrical Research Products Division are working on important devices for theatres of war.

At present these new developments must be nameless. But out of them should come technical advances of great value in making post-war sound recording and reproduction finer than any known to date.

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W. L. Lightfoot, *Associate Editor*

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Monthly Chat

NEW YORK STATE took an important step in the interest of labor relations when it created the School of Industrial and Labor Relations at the University of Cornell. Labor, employers and the public will watch its development with extreme interest and, it is predicted, if the experiment meets with the success anticipated, other states will follow the example of New York and establish similar schools.

As outlined in the act creating it, the purpose of the school is the teaching of the history of industrial practices of employers and employes, the history and principles of sound industrial relations, the rights and obligations of employers and employes, the development of labor law, and all other phases of employer-employe relations, tending to promote the public interest. The school is a part of the State Education Department and as such is open to anyone who is interested in the general field of industrial relations, whether from the management, worker, or public angle. Our own craft, for one, will watch interestingly the development of this pioneer school at Cornell.

• • •

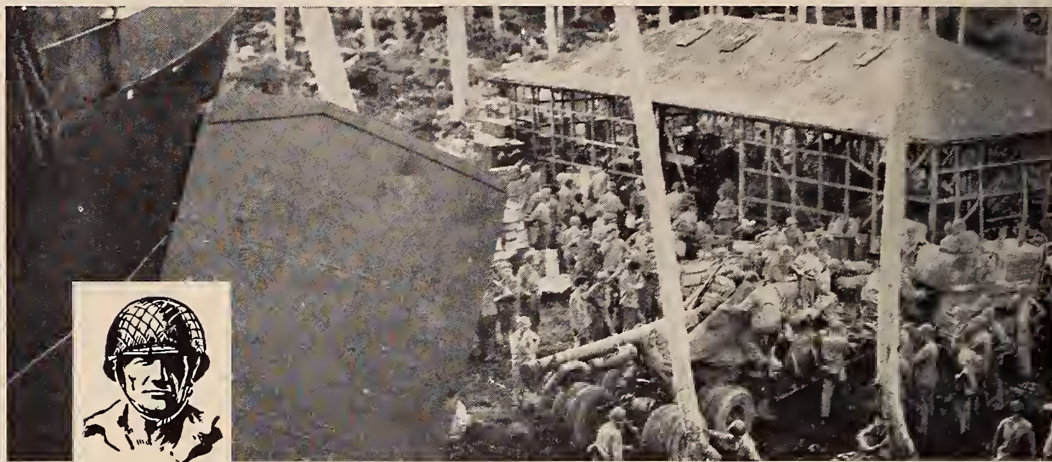
No great progress in the field of labor legislation has been marked this year, as only eight state legislatures met in regular session. Federal labor legislation that was enacted shows the impact of the war on labor standards, except in workmen's compensation, where the progress of the last several years was continued. In so far as states are concerned, many more legislatures will meet next year, and comparably greater progress is to be expected. As labor's aims undoubtedly have been retarded by the war it will be necessary next year to make greater efforts for the general good of the movement and in the public interest.

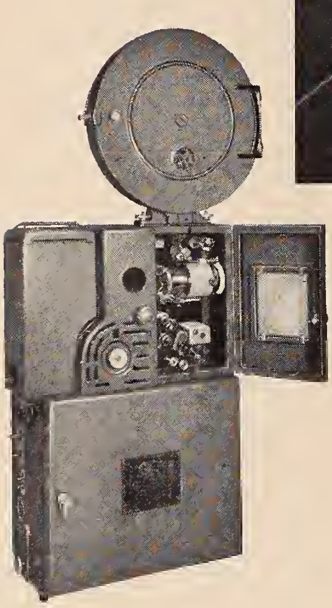
• • •

The annual meeting of the Theatre Equipment Dealers' Protective Association, to be held in Chicago Oct. 6-8 at the Hotel Bismarck will as usual prove interesting and profitable to those attending. All dealers and manufacturers who can attend the gathering should do so, keeping in mind, however, the cautions of ODT against unnecessary traveling. Many will be in or near Chicago when the meeting is in progress and as a result a good sized attendance may be expected.

A MARINE *"Tells It"* TO DEVRY

Official U.S. Marine Corps photo of Marine landing on Rendova Island in the Solomons.





WRITES Sgt. Walter R. N. ____________, U.S.M.C.: "DEVRYS projected the first movies on the Solomons in 1942. On Tulagi's King George Field, Columbia's "YOU BELONG TO ME" starring Barbara Stanwyck and Henry Fonda was screened Nov. 4, 1942"—by DeVry 35 mm. semi-portable sound projectors, as pictured above.

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You've heard the expression, "Tell it to the Marines!" Today a Marine *tells it* to DEVRY—a sergeant in the Second Marines writes from the South Pacific: "I have constantly been surprised by the amount of punishment your projectors will take—first off, in the holds of Navy Transports . . . Secondly, over rough jungle terrain in trucks, without roads to travel . . . Third,—while stationed at Paekakariki, New Zealand—not once but twice, the machines went through what is known as Southerly Gales, BOTH times—in our improvized tent theatre booth—the machines were dashed to the floor from a 32-inch height. All four DeVrys are still in good working order—even though they have taken severe punishment in their 16,000 miles of travel with the Second Marines!

Thus, out of the war's relentless proving ground comes unchallengable proof of the ability of DEVRY motion picture cameras and projectors to take day-in, day-out punishment and still deliver the finest in screened performances. Proof that you'll want to remember DeVry when you go shopping for V-Day's best in motion picture sound equipment. DEVRY CORPORATION, 1111 Armitage Avenue, Chicago 14, Illinois.

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INTERNATIONAL PROJECTIONIST

VOLUME XIX SEPTEMBER 1944 NUMBER 9

The Design of Sub-Standard Sound Projectors†

By *HOWARD CRICKS, F.R.P.S.*

FIRST of all, what have we to envisage as the probable fields of application of the substandard sound film? There will, of course, be a certain purely amateur market; but in view of the cost and complication of sound this will of necessity be restricted. The educational film appears to hold the greatest potentialities. There will be many industrial applications—publicity, technical instruction, research. In the propaganda field, the sub-standard film will to a large extent supplant 35-mm. The entertainment field will become increasingly important.

In view of all these outlets, it appears probable that practically all types of halls and auditoria, from school and village halls and works canteens to concert halls and kinemas, will as a matter of course be provided with 16-mm projectors. In the kinema itself, the 16-mm film, while I do not suggest that it will ever supplant the larger standard, will find subsequent application. The production of local topicals provides a field of application which has already been explored with success, both in this country and in America, although it is true that so far the accompanying sound has more often been recorded on discs. One can even visualize small kinemas running exclusively on sub-standard film, and thereby becoming exempt from most censorship and safety regulations—until our legislators become aware of this gap in public control.

Mobile kinemas, too, will bring entertainment, possibly as the jam covering the pill of propaganda, to the most isolated communities, and the sub-standard film is the obvious choice for such applications.

The British author discusses in considerable detail the mechanical, optical and electrical requirements which he believes must be met if the use of 16-mm projection is to be increased in accordance with existing opportunities. Alternate methods of design, and suggestions for improvement, are thoroughly examined. He notes particularly that 16-mm equipment is employed for many different purposes, and stresses that design features suited to amateur projection (for example) may prove entirely untrustworthy in semi-professional applications.

Reduction of Film Damage

The scope of the 16-mm sound film is in fact limited only by the standard of picture and sound quality that it can obtain. The use of color will enormously enhance the picture quality; sound will be improved by the use of fine-grain or grain-free emulsions, and a higher standard of processing. These advances will be nullified if the sound projector does not itself take place in this striving for perfection.

We may summarize three fundamental requirements in the design of the substandard sound projector: (1) reduction of film wear and damage, (2) efficiency of picture optical system, and (3) quality of sound. Let us consider the fundamental requirements of a projector under these three headings.

From the mechanical point of view, certain defects have been imposed—some may think unnecessarily—upon the 16-mm sound film by the standards adopted, and notably by the use of only a single perforation per frame. A trifling damage to a perforation, which on 35-mm film would pass unnoticed, can cause the intermittent motion to tear the perforations and jump a frame, resulting in the loss of the bottom loop in the projector, and, unless a trip device is fitted, extensive damage of the film.

This point of film damage is of major importance; it is particularly serious with sound films because of the increased running speed. It is a fact that many a proud owner of a film hesitates to project it too often because he realizes that its life is measured in terms of a relatively small number of showings. It is a matter of great commercial importance to film libraries whose costs are unnecessarily swollen by the short life of their copies.

† *J. Brit. Kine. Soc.*, April-June 1944.

The most obvious cause of film damage is, of course, the intermittent motion, and therefore our ideal projector must inevitably be of the non-intermittent type.[1] Desirable as this may be for the 35-mm machine, I am convinced that its value would be still greater in the case of sub-standard, simply because of the shortcomings of the film.

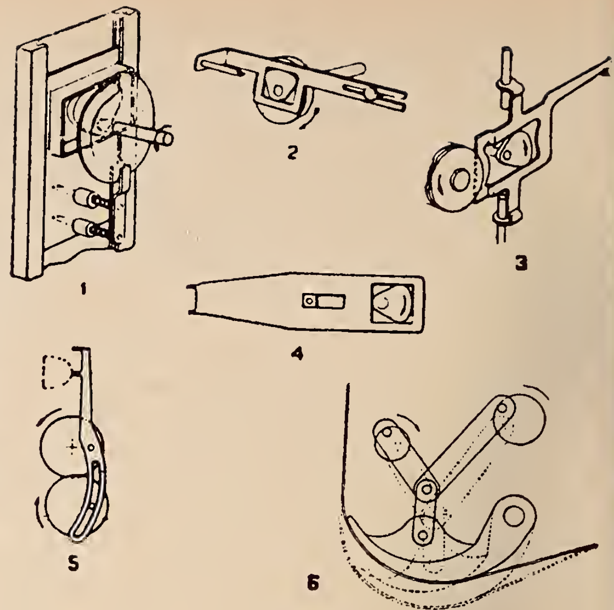
It is true that so far the non-intermittent principle has not proved itself capable of sufficiently good results for projection purposes, other than in the case of the miniature picture projected on an editing table; but I am sure that many sub-standard enthusiasts would willingly accept a lower standard of projection if the useful life of their films could be substantially lengthened.

It is, of course, probable that the reduced size of the sub-standard frame would assist in the design of intermittentless systems. For instance, where a reciprocating mirror is impracticable in a 35-mm machine, it might be found feasible on the smaller scale of the 16-mm frame, and with the rather lower standard of picture steadiness which is often acceptable.

As far as home projection is concerned, one can visualize the television set being provided with a film attachment, in which the film may run continuously and the picture will be reproduced on the television screen by purely electronic means.

FIGURE 1

Types of intermittent motions: (1) Pathe 9.5-mm projector; (2) Pathe camera; (3) Bell & Howell 16-mm projector; (4) Gebescope projector (old model); (5) Darling camera, and (6) Beater (Siemens).



Intermittent Motion

However, failing the realization of this ideal, there remains the need for a new type of intermittent motion. For film that is in good condition, the claw probably is quite suitable; but with the single perforation of the 16-mm film it makes worse the damage due to strained perforations, even if two or three claws engage with the film. The slightest perforation damage naturally causes unsteadiness, and generally leads to a film break. This defect is accentuated if the shift period is reduced with the object of improving shutter efficiency.

The beater movement, a modification of which was used on one machine, was rather superior from the point of film damage, but was inclined to be noisy and unsteady. The Maltese cross, universally used in 35-mm projectors (largely because of its rapid shift period, permitting of a two-bladed shutter with an efficiency of about 50%) has the objection that the four-slotted cross commonly used necessitates a four-picture sprocket, which is too small to provide satisfactory engagement with the 16-mm film; while a six- or eight-sided cross has theoretical objections. As shown in Figure 2, if tangential entry and leave of the striker pin is maintained, the shift period becomes too long, and if the customary 90° shift period is maintained, the pin cannot enter and leave the slots tangentially, a satisfactory acceleration and deceleration of the film is impossible and the motion causes noise and vibration.

However, experience shows that these objections are in practice not too serious, the saving factors being no doubt the play of the striker pin in the cross slot, and the small mass of film to be moved. It does seem possible that some modification of the six- or eight-sided Maltese cross might prove the most satisfactory type of motion, permitting of the use of a sprocket of reasonable size, with not less than three teeth engaging in the film perforations. Possibly an adaptation of the Powers movement would be suitable. As far as the kinema projectionist is concerned, a system embodying an intermittent sprocket rather than claws would certainly meet with his favor.

Design of Gate

The design of the gate has an important bearing upon the avoidance of film damage. The 16-mm film has very small "lands," or regions where pressure can be applied without fear of scratching picture or sound track.[2] (It would be interesting to know what the originators of the standard had in mind from the point of view of gate design). Yet, in view of the wide-aperture lenses commonly employed, and the high degree of screen magnification which may be required in future, it is vital that the film shall be held flat in the focal plane of the lens.

It is, therefore, essential that the gate should be made to a high degree of accuracy and rigidity, and capable of providing a perfectly even tension, accurately applied to the lands of the film. A stamped metal component does not adequately meet these requirements, and the small additional cost of a properly machined gate must be regarded as a necessary investment. There is much to be said for the type of gate which merely grips the film by the edges; this, of course, involves curving the gate to avoid buckling of the film, and the use of hardened steel to minimize wear by the film.

It is important with any type of gate that it would be easily cleaned, and for this purpose the use of an easily removable gate is to be commended.

In one respect, our first two requirements of the sub-standard projector—care of film, and maximum optical efficiency—are antagonistic. The principal point of light loss is the rotating shutter. With a view to improving its efficiency, the film shift period may be reduced which, as has just been suggested, will result in increased film wear.

In this connection, I would make a minor suggestion—it has always been taken as an axiom that the flicker blade of the shutter must be of equal angle to the cover blade if a flickerless picture is to result. But flicker perception is a function of both speed and light intensity[3]; at low screen brightness it would be possible to tolerate a shutter with unequal blades, which on a brighter picture would cause unpleasant flicker. I therefore suggest the possibility that the flicker blade should be made of variable angle, so that with low light intensities—in other words, when showing on a large screen—it could be reduced in covering angle, the resultant 24-cycle flicker being rendered tolerable by the reduced susceptibility of the eye to flicker.

A source of minor annoyance with most existing machines is the method of framing. The principle used of moving the gate aperture to accommodate minor

variations in the position of the camera mask line on the film is one that was abandoned many years ago in 35-mm machines. It has the objection that as one frames, so the aperture shifts on the screen, and if one has gone to some trouble to get the screen nicely masked, the alignment of the projector has to be altered.

It is very simple to obviate this fault —merely cause the lens to move with the aperture. The "fixed optical center" principle used on modern 35-mm machines in which it is the intermittent motion that is moved, and not the lens or aperture, entails an unnecessary complication, because a "half-frame" or "one-hole frame" is impossible with sub-standard film, and the small amount of movement needed does not seriously affect the illumination of the gate.

Optical Efficiency

Users of sub-standard projectors are beginning to realize that there are other factors entering into the question of screen brightness than the wattage of the lamp. The practice of designating a projector by the wattage of its lamp and the resultant assumption that all machines having the same wattage lamp would give an equally brilliant picture, obviously overlooks many factors.

One make of projector shows a considerably increased efficiency over most other types, thanks to the use of carefully calculated optical components, but even with this system it is safe to say that far more light is wasted than is used.

The biplane filament lamp widely used is, of course, rather more efficient than the monoplane from the points of view of overall light emission and evenness of illumination over the picture area. For some obscure reason, the 35-mm portable projector generally dispenses with a mirror, while practically every 16-mm machine includes a mirror behind the lamp. The lack of a mirror naturally results in an increased waste of light.

Unfortunately, a mirror cannot be advantageously used behind a biplane filament because the staggered filament intercepts the light reflected from the mirror. The mirror has in fact the effect of shortening the life of the lamp, first by concentrating additional heat upon the filament, and secondly by raising the temperature of the glass envelope, so leading to softening and bulging and often to premature failure.

I draw attention to this deficiency in existing optical systems without being able to suggest an alternative. A useful direction of research seems to be the combining of the mirror and condenser within the lamp itself.

There is a tendency on the part of manufacturers to fit short-life lamps, which naturally have a higher light output, since the short life is due to a higher working temperature of the filament, and temperature and light output are practically synonymous. Manufacturers may think to lengthen the life of the lamp by the use of a powerful blower, which in point of fact simply avoids softening of the glass envelope, and does not materially affect the life of the lamp other than by reducing the risk of premature failure.

If a short-life lamp is fitted, I regard it as most desirable that a 100-hour lamp should be also available for those willing to sacrifice screen brightness. (It would be interesting to know to what extent the high cost of projection lamps is due to the variety of caps used.)

Undoubtedly, in the not very distant future, the discharge lamp will be sufficiently perfected for use in the sub-standard projector. It will have many advantages over the filament lamp, notably greater efficiency and reduced heat output. The two obvious objections which must be overcome before it can be successfully used are, first, the long delay in striking and especially in re-striking when hot, and secondly, the color of the light, which, since one must envisage color films becoming almost universal, must be improved to give a properly balanced spectrum.[4]

It appears, too, that present types of discharge lamps must be run on direct current in order to avoid flicker, necessitating a costly and bulky rectifier when used on a.c. mains.

While on the subject of lamps, I must register a protest against the use of inferior lamp-holders. Over-heating due to poor contact is quite common, while I recall an occasion when arcing in the holder welded the lamp cap firmly to the contact!

We may now turn to our third point—the question of sound quality. The 35-mm sound film took years to reach the most elementary criterion of quality—intelligibility of speech (to-day one must admit that is far from universal). The 16-mm sound film starts off with several handicaps, some inherent, others imposed by the standards adopted.

Sound Quality

The principal factors in sound quality are frequency range and volume range, or signal/noise ratio. The 16-mm film travels at two-fifths the speed of 35-mm. If we take 10,000 cycles per second as the upper limit of frequency of 35-mm film, we should regard 4,000 cycles as the corresponding limit for 16-mm. The width of the track is only three-fifths that of 35-mm and the area therefore about one-quarter; the signal/noise ratio will thus be about 6 db. less.

These are inherent difficulties in *any* sub-standard sound film. They can be, and must be, overcome to a considerable extent by the most scrupulous attention at every stage of production, processing, and projection to the one vital requirement of sound quality.

Other defects have been imposed upon the 16-mm sound film by the standards adopted, and notably by the use of only a single perforation per frame. True, this has the advantage that there is no perforation adjacent to the sound track, and consequently less risk of sprocket-hole noise (whether due to developer streaks or "polygoning" in reproduction); but film weave, or an inequality in length of the two sides of the film, does undoubtedly cause variable quality

(*Continued on page* 15)

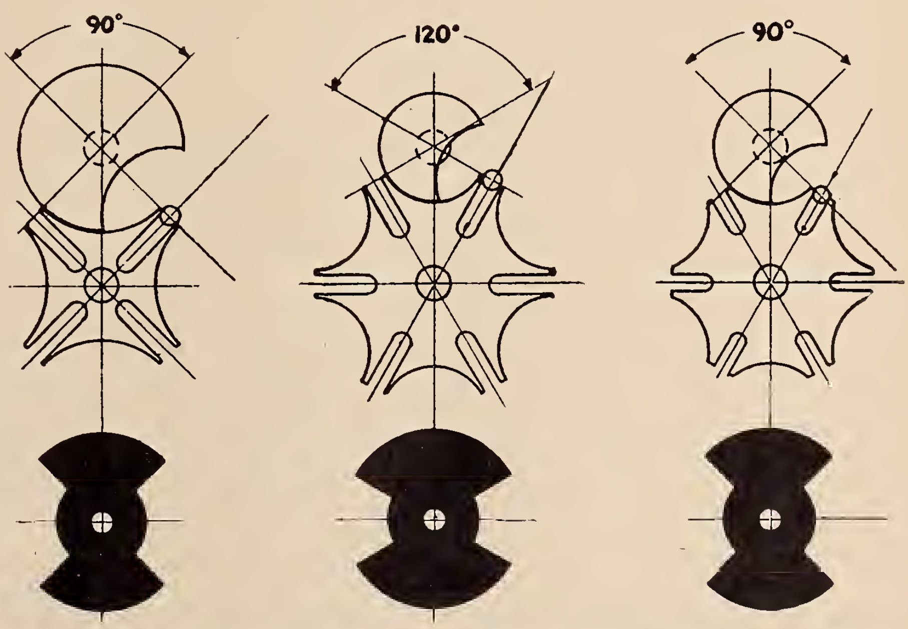


FIGURE 2. *Four- and six-picture maltese crosses and their respective shutters.*

Presenting: Albert F. Ryde

ALBERT F. RYDE, business representative of I. A. Local No. 233, was born in Buffalo, N. Y., on November 17, 1891, one of thirteen children. He went to work at an early age due to the fact that his father, who was a railroad man, lost out in a strike. That may be one of the reasons that "Bert" Ryde become "union-minded" early in his work and has remained so ever since.

Back in 1907 he went to work as an errand boy for Louis Holzborn, who operated a small nickelodoen—May's Theatre—in Jamestown, N. Y. He worked there as an usher, and sold and collected tickets at night. All these duties, however, did not fill his full interest. He always was interested in the projection room and spent most of his spare waking hours there. This interest lead to his learning to operate the projection machine, after which time he secured his first job as a full-fledged projectionist.

In those days Ryde liked to move around, as he felt he would gain in experience, and he was one of the roving projectionists that have more or less passed out of the picture. He not only put in a day's work as a projectionist, but during one period, after the theatre closed, doubled in outside parttime jobs. Among the old time companies he worked for were General Film, Mutual Film, and Victor Film (which later became the Universal Film Co. under Pat Powers).

During his experiences in the business, Ryde was in charge of the advertising department in Buffalo of the Triangle Film Company, and when First National Film Company was organized and opened a Buffalo branch he was their booker and assistant manager.

He was one of the organizers of Buffalo's first motion picture projectionists union in 1909, then known as the Buffalo Motion Picture Operators' Union Independent. In 1910 he was responsible for securing an auxiliary charter from the I. A. T. S. E., known as Auxiliary Branch 4 to Local No. 10, Stage Hands' Union, but later received a charter of its own.

When sound pictures were getting started in 1928 he was elected business representative for Local No. 233, and it was due principally to his efforts that the local became known as one of the most progressive in the country. Manpower and wages were doubled within a short while, and progress has been registered ever since.

Ryde is a firm believer in the long term contract which provides for gradual increases and improvements in working conditions. Recently he successfully negotiated a new three-year contract, bringing the salaries of the local membership up to the limit of the Little Steel Formula.

In addition to acting as business representative for Local 233, he is a member of the executive board and legislative committee for District No. 10, State of New York. Since 1928 he has attended all I. A. conventions as a delegate from his local. He makes it a practice to attend as many of the A. F. of L. conventions as he possibly can, being of the opinion that much valuable information pertaining to the labor movement in general could be picked up at the sessions.

Bert Ryde is prominent in the political world of Buffalo and in civic and national movements. He numbers among his many good friends in both political parties Edwin F. Jaeckel, state chairman of the Republican party, and Paul Fitzgerald, state chairman of the Democratic party.

In 1934 he received an appointment to the Stadium commission, and in 1938 he was appointed chairman of the Labor Division of the successful Mayor Holling Campaign Committee. As a reward for his splendid work and at his special request, the mayor appointed Elmer Winger, treasurer of Local No. 233, to the important post of Commissioner of Licenses for the city of Buffalo.

After the construction of the new $3,000,000 Auditorium, which was combined with the Stadium, they were both placed under the control of one commission. Ryde was then re-appointed to a five year term as vice-chairman of the commission. Again he was successful in his request for the transfer of Winger from the License Division to the directorship of both the Stadium and the Auditorium. Incidentally both Ryde and Winger have been publicly acclaimed for their share in the financial success of these two public-owned enterprises.

In 1943 Ryde was appointed a member of the newly formed Buffalo Planning Commission. In addition to his other duties he serves on the Appeals Board of the United States Selective Service System, and is a member of the Office of Civilian Mobilization governing board of Buffalo.

His hobby is sports of all kinds, fishing being his favorite. During the summer months he manages to squeeze in a few days' fishing in northern Canada, and in winter fishing in and around the waters of Florida constitute his chief relaxation.

"E" AWARD FOR MOTIOGRAPH

The coveted Army-Navy "E" award for excellence in war work has been awarded to Motiograph, manufacturers of Motiograph projectors and Motiograph-Mirrophonic sound systems. Only about four per cent of eligible companies have thus been distinguished. Formal ceremonies took place in the Chicago plant. Awards of the "E" flag and employees' pins were made by Major H. C. Robson, of the Army, and Lt. Commdr. William P. Rock, of the Navy, with Francis E. Matthews and a selected group of employees acting in behalf of the company.

Orthoscope Lenses New Projection Aid

THE new Orthoscope lenses, developed by H & H Optical Company of Hollywood, and distributed exclusively by National Theatre Supply Company, is claimed to be a great step forward in the improvement of projection optics. This new product consists of two additional lenses—positive lens placed, in most cases 1¾ inches from the film, and a negative lens placed about 6 inches from the film. The principle of the negative lens is to increase the carbon crater seven to fourteen times its normal size, depending upon the type of lamp in use and other contributing factors.

The positive lens collimates the light on the film at the aperture plate, enlarging the film image to cover the rear combination of the objective lens. This gives an equal distribution of light all over the screen. The result, it is said, is a clear, flat field in which the hot spot of ordinary projection becomes a soft light which eliminates eyestrain from any audience point of view—near, far or diagonal. In most cases the overall light has been increased as high as 61 per cent, and in working with the Orthoscope lenses the projectionist seldom has to re-focus a picture once it is set—the light is even and the focus sharp.

Ordinarily when viewing a picture from the projection room with the aid of opera glasses, any white object on the screen will appear to be rimmed with a rainbow effect, but the makers of the Orthoscope lenses state that their product eliminates this chromatic aberration, whether the film be in black-and-white or in color.

A Signal Corps Photo

THEY'RE former patrons of yours, now in the Mediterranean theatre of war.

They're about to see some movies... one of the closest of their home ties ...second in importance only to mail.

Tomorrow—perhaps even yet tonight—they'll be called upon to go out and face the enemy...maybe even to stop a bullet!

Never mind the sympathy, they don't want it. They're only doing their duty. What they want to know is whether we're doing ours. And part of our duty is to buy War Bonds with every dime and dollar we don't actually and truthfully need. We've got to buy double what we did before—NOW!

This in a small way says "thanks" to these boys. But don't expect applause, for we can't match their sacrifice by merely *lending* money.

☆ Most of the Strong Lamps now being produced are going to the fighting fronts where they are pouring out their light to the screens which mean so much to our boys over there.

The Strong Electric Corporation

87 City Park Avenue • Toledo 2, Ohio

"THE WORLD'S LARGEST MANUFACTURER OF PROJECTION ARC LAMPS"

Projectionists' Course on Basic Radio and Television

By *M. BERINSKY, E. E.*
MEMBER OF INSTITUTE OF RADIO ENGINEERS

III. — DIRECT CURRENT CIRCUITS

IN LAST month's installment we discussed several methods for the proper solution of Ohm's Law problems. Figure 2 of that article (which is being shown again this month as Figure A) illustrates a simple means for finding the solution of direct current problems. Cover the unknown quantity on this diagram with your finger and the remaining letters give the correct formula.

We will now demonstrate how this device actually is used. Let us suppose that a rheostat in a 110-volt circuit causes a current of 5 amperes to flow and it is desired to find what the resistance of the rheostat is under these conditions. In this problem the voltage in the circuit is given as 110 volts and the current is listed as 5 amperes. The resistance of the rheostat obviously is the unknown quantity. Following the instructions given above, cover the unknown quantity which in this case is *R*. The letters which remain in Figure A are *E* divided by *I*, or in other words, voltage divided by current. The voltage in this particular problem is given as 110 volts and the current is 5 amperes. Divide 110 by 5 and you get 22; the answer is, therefore, 22 ohms.

A new symbol will now be introduced. Instead of writing out the word "ohms" after a number such as "22 ohms" in the above problem, it has become conventional to use a symbol instead. This symbol which takes the place of the word ohms, is the Greek letter "omega." The symbol for omega is Ω. To write 22 ohms we simply write the number 22 followed by the symbol omega, as 22Ω.

It is also desirable to use symbols or abbreviations after the number which represents volts. For example, we merely write 110 v. for 110 volts. The same holds true for current. It is conventional to designate 5 amperes by 5a.

Let us tackle another problem. Suppose that a 50-ohm soldering iron is connected to a 100-volt source. How much current will be taken by the iron? Again we refer to Figure A. In this problem the unknown quantity is the current, therefore it is necessary to cover up the letter *I* in order to get the proper formula. When the letter *I* is covered up the remaining letters are *E* divided by *R*. Solving the problem we find that 100 volts divided by 50 ohms equals 2 amperes, or 2a.

Let us consider a third problem. A 100-ohm resistor is found to draw 3 amperes from a certain battery. How many volts are contained in this battery? The unknown quantity in this problem is the voltage *E*, so we cover up the letter *E* in Figure A and the remaining letters are amperes multiplied by ohms, or *I* times *R*. Solving this problem we have 3 amperes multiplied by 100 ohms, or 300 volts, written 300v.

In order to gain proficiency in the art of solving these problems it is suggested that the reader try several at home, assigning any number to two of the quantities and finding the unknown.

Power

Whenever current flows through a resistor, power is dissipated within it. This power appears in the form of heat. For example, a resistor which dissipates 10 watts will become much warmer than one which consumes 2 watts. Resistors are rated in watts as well as in ohms. When we buy resistors we should signify the wattage rating. For instance, if we want a 10-ohm resistor we should ask for a 10-ohm, ¼-watt size, or 10-ohm, ½-watt, etc. If a ¼-watt resistor were used in a circuit which called for a 1-watt resistor, the ¼-watt resistor would burn out in a very short time. It would, therefore, be unwise to use a resistor in any circuit if its wattage rating were smaller than required.

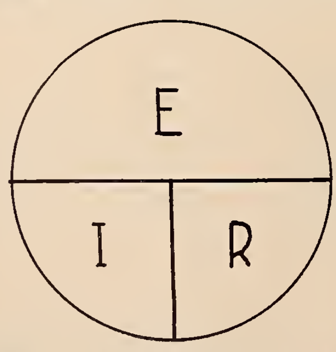


FIGURE A. ***A simple means for finding the proper Ohm's Law formula.***

The cost of a resistor depends largely upon the wattage rating and not upon the ohms rating. A resistor which has a large wattage rating is larger physically than one having a smaller rating. It must be larger in order to be better able to dissipate a greater quantity of heat. Due to the increased physical size of resistors rated to dissipate large amounts of heat, a resistor having such a rating must contain more material and will be more expensive than a resistor rated at a lower value.

There are two types of resistors used in radio equipment—carbon and wire wound. Carbon resistors are of the low wattage type varying from ¼ to 5 watts. Resistors that are rated above 5 watts are of the wire-wound type. Wire-wound resistors are capable of dissipating more power than carbons because it is a relatively easy task to choose a wire-wound size that is large enough and durable enough to dissipate any amount of power found in modern radios. Resistors that are rated above 20 watts usually are coated with porcelain or some other ceramic material in order to give them better heat resisting qualities.

Since the power in a circuit is a very important quantity, and because the power in a circuit must be known before a resistor could be obtained, some formulas for power will now be noted.

$$(1)\ \text{Power} = \frac{E^2}{R};\quad (2)\ \text{Power} = \text{Volts} \times \text{Amps};\quad (3)\ \text{Power} = I^2 \times R.$$

The term E^2 simply means *E* times *E*. The term I^2 means *I* multiplied by *I*. Equation (1) is used when *E* and *R* are known; equation (2) is used when *E* and *I* are known; and equation (3) is used when *I* and *R* are known.

Let us now try some problems on power involving all three formulas. Suppose that a 5-ohm resistor is connected across a 10-volt battery. How much power will

this resistor consume? Since E and R are known it is advisable to use the first formula for power. The other formulas for power could be used but it would then become necessary to solve the problem for the current in the circuit because formulas 2 and 3 both involve a current term. Using formula 1, we have

$E = 10$ volts and $R = 5$ ohms, then,

$$P = \frac{E^2}{R} = \frac{10 \times 10}{5} = \frac{100}{5} = 20 \text{ watts.}$$

The resistor should be capable of withstanding 20 watts and if we were to purchase a 10-ohm resistor for use in the circuit above we would have to specify that the resistor be rated at 20w. It has become a practice in radio work to rate resistors conservatively. This is done by doubling the calculated value of power. In the above example, for instance, the calculated value of power is 20 watts. A 20-watt resistor probably would work very well in such a circuit but to really be an the safe side it is common practice to double this value. If you were buying a resistor for this circuit you would ask for a 40-watt size. Although this is not an economical practice it is, nevertheless, good engineering since possibilities of a breakdown due to an overheated resistor are cut to a minimum.

We will now demonstrate the use of formulas 2 and 3 to solve the problem for the power. Looking at these formulas we can see that they both contain an I term. The original problem does not give us the current in the circuit. It simply states that a 5-ohm resistor is connected across a 10-volt battery. In order to solve this problem for power we have to find the value of current flowing in the circuit since this information is needed in formulas 2 and 3. The application of Ohm's Law will help us find the current in the circuit. Current equals voltage divided by resistance. Substituting the values given we have I equals E (10) divided by R (5), and the answer is 2 amperes. Having found the current we can now use formulas 2 and 3.

Using formula 2, P equals $I \times E$, equals 2×10, equals 20 watts, which is the same answer that we obtained in using formula 1. The use of formula 3 will now be demonstrated. In this formula I and R are needed, and we already know what these values are. The power by formula 3 is equal to I squared multiplied by R. Substituting the known value we have P equals 2 squared times 5, equals 4 times 5, and the answer, as before, is 20 watts. From the above example it can be seen that all 3 formulas will yield the same answer.

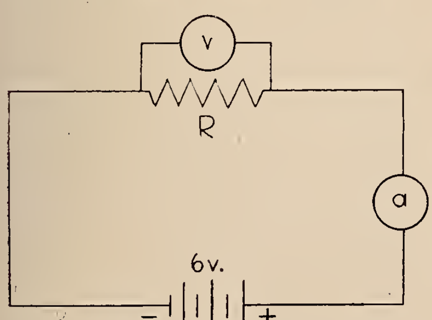


FIGURE 1. ***Proper connection of voltmeter and ammeter in simple direct current circuit.***

Practical Circuits

The use of Ohm's Law will now be extended so as to include several types of practical circuits. The first circuit to be analyzed is one that includes a voltmeter and an ammeter in addition to a resistor and a battery. See Figure 1. You will note that the circuit must be broken in order to insert the ammeter. An ammeter is a device that measures the amount of electrons (current) which flow past a point in a circuit. When the circuit is broken at any point and an ammeter is inserted it will give a correct reading. The resistor in Figure 1 is called the load resistor, or simply the load. A circuit whose component parts are connected in one continuous chain is known as a series circuit, and the components are said to be connected in series with each other. In Figure 1 the resistor and the ammeter are connected in series. In practice, an ammeter is *always connected in series* with all of the other circuit components.

CORRECT ANSWERS TO AUGUST QUESTIONS

1. $R = 2$ *ohms.* 2. $I = .08$ *amps.*
3. $R = 4.5$ *ohms.* 4. $E = 1$ *volt.*
5. $I = 2.3$ *amps.* 6. $E = 4$ *volts.*

The voltmeter in Figure 1 is connected *across* the load resistor. A voltmeter is a device which measures the amount of electrical pressure that is present across any circuit path. Electrical pressure (voltage) is considered to exist across a device and not in series with it, as is the case with current. Voltmeters, being indicators of electrical pressure, are always connected between two points, across a resistor or other component. It is not necessary to break a circuit in order to connect a voltmeter.

When one piece of electrical equipment is connected directly across another, we say that the components are connected in parallel with each other. Several other terms are commonly used, such as multiple and shunt. In Figure 1 the voltmeter is connected in parallel with the load resistor. We now know that two types of connections are commonly used in radio work, namely, series and parallel.

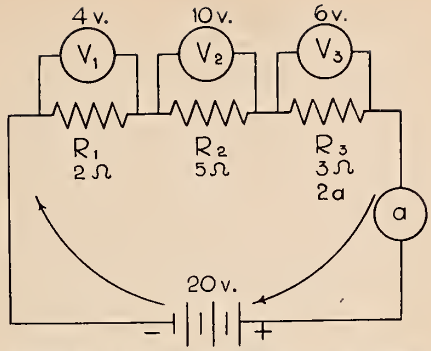


FIGURE 2. ***Three resistors in series with proper connections for voltmeters and ammeter.***

Let us first consider the series circuit. In Figure 2 we see three resistors connected in series with an ammeter and a battery. Whenever resistors are connected in series, the current that flows in the circuit is the same for all of the resistors. For example, in Figure 2 the current is shown being equal to 2 amperes. This means that the same 2 amperes is flowing through the entire circuit and through each resistor. When a current flows through a resistor a voltage appears across its terminals. This voltage usually is called a "voltage drop." When several resistors are connected in series the total resistance of the circuit is equal to the sum of the individual resistances.

Stating this fact mathematically we may say that $R_t = R_1 + R_2 + R_3 + \ldots R_n$, where R_t is the total resistance of the circuit, and R_1, R_2, and R_3 are the individual resistances. This formula holds true for any number of resistors so long as they remain connected in series. Figure 1 gave R_1 as 2 ohms, R_2 as 5 ohms, and R_3 as 3 ohms. The total resistance in such a circuit is equal to the sum of the individual resistances. Summing up we find that $R_t = 2 + 5 + 3 = 10$ ohms. The total circuit resistance then is 10 ohms and the voltage is given as 20 volts.

We now can find the total current. According to Ohm's Law $I = \frac{E}{R}$. In Figure 2 the total voltage is shown as 20 volts and the total resistance is 10 ohms. Substituting these values in the formula for current we have $I = \frac{20}{10} = 2$ amperes. The correct value of current for Figure 2 is 2 amperes, as shown on the ammeter reading. When resistors are connected in series a certain amount of voltage is dropped across each one due to the fact that current flows through them, and we know that whenever current flows through a resistor a voltage appears across its terminals. We may calculate the amount of voltage that is dropped across each resistor in Figure 2 by the correct use of

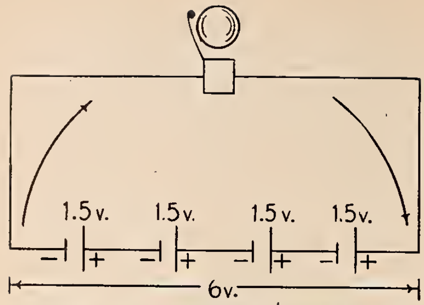


FIGURE 3. ***Batteries connected in series to obtain high voltage.***

Ohm's Law.

First, let us solve the problem for the voltage drop across the 2-ohm resistor. We are trying to find the voltage, hence we must use the formula $E = I \times R$. The current in the circuit equals 2 amperes and the resistance of R_1 is 2 ohms. Using the formula we obtain $E = 2 \times 2 = 4$ volts. This voltage would be indicated by the voltmeter V_1. The voltage across R_2 is found in a similar manner. The formula is the same as before—$E = I \times R$, and the solution is $E = 2 \times 5 = 10$ volts. The voltage across R_3 also is found the same way, and the solution for E_3 gives 6 volts. The sum of all the voltage drops in a series circuit is equal to the line voltage. Adding the voltages in Figure 2, we find that $4 + 10 + 6 = 20$ volts, which is the voltage of the battery.

Following is the procedure necessary for the proper solution of ordinary series circuits:

1. Find the total resistance of the circuit using the formula $R_t = R_1 + R_2 + R_3$.
2. Find the total current in the circuit using the formula

$$\text{Total Current} = \frac{\text{Total } E.}{\text{Total } R.}$$

3. Find the voltage drop across the individual resistances; the voltage across R_1 equals the current through R_1 times the resistance of R_1; ($E_1 = I \times R_1$), ($E_2 = I \times R_2$), and ($E_3 = I \times R_3$).

Batteries in Series

Batteries are quite often connected in series. This is done when a voltage larger than that which is obtainable from one individual cell is desired. For example, if 6 volts were needed for a house bell and only 1½ volt dry cells were available, it would be necessary to connect 4 such cells in series in order to obtain the 6-volt pressure. The circuit diagram for such a connection may be seen in Figure 3. You will note that the plus terminal of one battery is connected to the minus terminal of another. If the plus of one battery were connected to the plus of another the circuit would be incorrect and the voltages would not be additive. The arrows in Figure 3 denote the direction of current flow.

A practical application of Ohm's Law in relation to radio circuits is illustrated in Figure 4. The tube used is a type No. 201-A. This tube has a filament voltage of 5 volts and takes a current of ¼ ampere (.25 amperes). It is obvious that if a 5-volt tube were connected across a 6-volt battery it would receive one volt too many. The life of the tube would be shortened under such operating conditions.

In order to insure proper voltage for the tube it is necessary to insert a resistor in series with the tube and the battery. Since the tube is rated at 5 volts and the battery contains 6 volts, the difference of one volt must be dropped across R. The problem is in knowing how large a resistor to use. It is clear that one volt must be dropped across R, and it is evident that the current in the circuit will be .25 amperes because it is a series circuit and the current will be the same everywhere. To find the proper value of R simply use Ohm's Law ($R = \frac{E}{I}$), R is the unknown, $E = 1$ volt, and $I = .25$ amperes, therefore $R = \frac{1}{.25} = 4$ ohms.

A.C.-D.C. Filaments Circuits

One of the most common applications of series circuits occurs in the a.c.-d.c. radio receiver. These receivers use a line cord which contains three wires instead of the two that are found in all a.c. radios (ordinary lamp cord). The third wire is a resistance element. The repairman is often called upon to replace these line cords because the resistance element becomes brittle and finally opens up with continued use. Circuit diagrams of small a.c.-d.c. receivers are not always available to the serviceman, and he should, therefore, be able to calculate the proper ohms value of these line cords.

Figure 5 is a schematic diagram of the filaments of four tubes connected in series. The line cord resistor is labeled R. The filament of a tube is that part which causes the tube to light. The symbol for a filament looks like an inverted

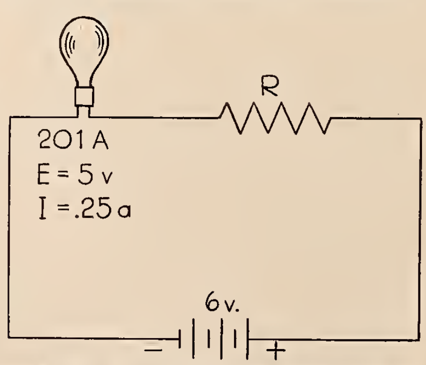
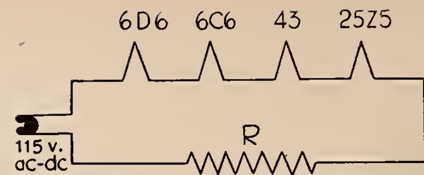


FIGURE 4. ***Tube and protective resistor connected in series.***



TYPE	E. FILS.	I. FILS.
6D6	6.3 v	0.3 a
6C6	6.3 v	0.3 a
43	25 v	0.3 a
25Z5	25 v	0.3 a

FIGURE 5. ***A.C.-D.C. filament circuit.***

V. The chart accompanying the diagram in Figure 5 gives the voltage ratings of the four tubes. Since the tubes are in series we must add all voltages. Adding 6, 6, 25, and 25, we find that the filaments require 62 volts for proper operation. If we plugged these tubes directly into the 110-volt outlet, one or more would burn out because the circuit would be getting 48 volts too many. To prevent such an occurrence, a resistor is placed in series with the tubes. This resistor must be capable of absorbing the additional pressure of 48 volts, and it becomes desirable to find the value of resistance necessary. We know that the resistor will drop 48 volts across its terminals. We know also that the current in the circuit is .3 amperes because each tube takes the same current in a series circuit. To find the resistance use Ohm's Law for R.

$$R = \frac{E}{I}, = \frac{48}{.3} = 160 \text{ ohms.}$$

When purchasing resistors we should specify their heat resisting qualities (wattage rating). To find the wattage rating any of the formulas for power may be used. Using the formula $P = E \times I$, we find that the resistor should have a rating of $48 \times .3$ or 14.4 watts. Such a value would be unobtainable because wattage ratings are given in round numbers. In this case a 15 or 20 watt resistor would be sufficient.

SEPTEMBER QUESTIONS

1. A toaster draws 5 amperes when connected to 110-volt mains. Find its resistance. How much power does it consume?

2. Two No. 201-A tubes are connected in series with a resistor to a 15-volt battery. How much resistance is required in order that the tubes light properly? How much power should the resistor be capable of dissipating?

3. A 10-ohm and a 15-ohm resistor are connected in series to a 100-volt source. Find: (a) the total resistance of the circuit; (b) the total current; (c) the voltage drop across the 10-ohm resistor; (d) the voltage drop across the 15-ohm resistor.

The correct answers to these questions will appear in the next issue.

DESIGN OF SUB-STANDARD SOUND PROJECTORS

(*Continued from page* 9)

by increasing the difficulty of maintaining the film in the focal plane of the sound scanning system.

Of equal importance is the avoidance of wow and flutter. The adoption of designs which have proved successful in the 35-mm field for maintaining a constant film speed is, I am aware, beset by difficulties, notably the increased weight and cost, and the problem of avoiding patent infringement; nevertheless, development in this direction is a logical step. First, there must be complete isolation of the film in the sound head from the intermittent motion, by means of an interposed sprocket and a free loop; next, the method of stabilizing film speed in the sound head must be improved, preferably by the adoption of the fluid-flywheel or magnetic drive.[5]

A question sometimes asked is whether there is any advantage in making use of the projection lamp for sound excitation, as is done in some projectors, as compared with the use of a separate exciter lamp. One advantage certainly is that there is a large filament image, and condenser adjustments can, therefore, be dispensed with. A 100-cycle mains hum can sometimes be heard when running on a.c., but, due to the large thermal inertia of the filament, this is rarely noticeable. Economy is effected, both in the provision of an additional lamp and its holder, and in the power supply circuit.

A serious defect is, however, that the projection lamp has to be of a non-standard type, burning cap upwards; standards should certainly be fixed for lamps of this type.

The points of design so far discussed are fundamental to any type of sub-standard projector. Let us turn to a rather different aspect.

16-mm Versus 35-mm

Increasingly in future the 16-mm film is going to be compared with 35-mm. A point that is often overlooked is that, while the projector upon which the sub-standard film is shown is generally a fairly light portable machine with all the objections that portability entails, the 35-mm film with which it is compared will be shown generally on a static type of machine where weight and size are virtually unlimited.

Sub-standard projector design must develop along two distinct lines. There will be many static situations where the need is for a machine virtually a miniature of the normal kinema projector. I envisage a very considerable demand for machines of this type in news-theatres, in public-halls, and in the many village and church halls that will be built or re-built after the war.

In the opposite direction is the portable projector. Here, lightness and compactness are important virtues. The machine must be easily assembled and quickly brought into operation.

Let us consider the former type first, since, although we have yet to see such a machine, there is little to be said about it—simply that it must in most essentials follow the lines established for existing kinema projectors.

It must employ an arc—or possibly later a discharge lamp—as illuminant. The gate must be efficiently cooled to withstand the intense concentration of heat in an area less than a quarter that of the 35-mm frame; the machine will not need to be enclosed and noise is unimportant. The whole machine must be substantially built, a pair of them capable of running a 12-hour programme daily without undue depreciation either of machines or films.

One thing I would urge is that the whole machine — projector, soundhead, and illuminant—must be regarded as an entity, and that we should not get led into the cardinal fault of 35-mm equipment, that is, the manufacture of the mute head, sound equipment, and arc by different firms, whose various products are used together indiscriminately and without regard to their respective suitability. The projector and soundhead must be a single unit, easily demountable from the stand. It would be of value if the soundhead were capable of connection to the existing amplifiers, otherwise it will in some cases necessitate the duplication of amplifiers and speakers.

Here especially particular care is needed in the design of the picture gate, since such a machine will normally be used with short-focus wide-aperture lenses, in order to obtain the requisite picture size and brightness. Film buckle must at all costs be avoided. The points I made previously are still more vital—the avoidance of film buckle by means of a curved gate, and the reduction of gate heat by means either of air or water cooling. As I have already suggested,

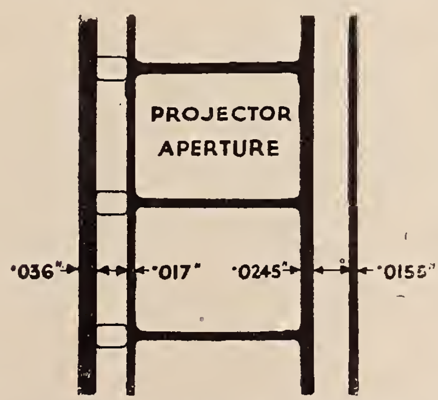


FIGURE 3. ***16-mm film showing lands.***

the average projectionist will, in default of a non-intermittent projector, prefer an intermittent sprocket to a claw.

Such will be the machine which I envisage will be demanded for installation in a large number of kinemas and other public auditoria. But this does not alter the fact that a large proportion of the market will be better served by a transportable machine. There is scope for a variety of types, from the purely amateur machine and the semi-professional type—for instance, for educational purposes—to the fully professional model.

Recommendations

Some admirable recommendations on the requirements of projectors for educational purposes are embodied in a leaflet issued by the British Film Institute[6], many of the proposals would apply equally to other types of machine. The principal objects of the proposals are simplicity, and ease of control and maintenance. To quote a few points from this leaflet:

Controls should be planned so that, as far as possible, they are brought to a control panel on the right-hand side of the machine. Control knobs should be of distinctive shapes, so that they may be distinguished by touch. Furthermore, a standardized system of color-coding for controls should be introduced, so that controls on a strange machine are immediately recognized.

Sequence interlocks should be provided to prevent operations being performed in such an order as to damage either film or machine. (*This relates chiefly, of course, to the lamp and motor switching, which should be controlled by the one turn-switch to prevent the light being shone on stationary film.*)

Plugs should be so designed that it is impossible to insert them in any but the correct socket. (*I would also add—in any but the correct polarity.*)

Every effort should be made to reduce mechanical noise to an absolute minimum.

Fixed speed controls should be fitted enabling the machine to be run at fixed speeds of 16 and 24 frames per second.

Threading should be made as simple as possible. . . . There should be an inching device, and if a screw is used for the purpose, it should give a visual indication of the position of the claw (if fitted) when threading. (*A trip device should operate automatically if loops are lost—a device undoubtedly calculated to reduce film damage.*)

Still-picture device and reverse are required, the latter on silent machines and where possible on sound machines also. (*Difficulty may arise in the latter case from the soundhead loops.*) A power rewind is demanded. Independent levelling and tilting devices are urged. Finally—an important point—"Direction of rotation of feed and take-up spools should be standardized so that films are not wound inside-out."

One may regret that greater stress was not laid upon the fundamental point of reduction of film damage. Another point to be mentioned is the elimination of

stray light from the lamphouse. Otherwise there is little to be added to these suggestions which are obviously the result of practical experience, unless it be to suggest that they do not go far enough.

My own idea of the educational projector is a teaching aid to which the teacher can turn as easily and as naturally as to his blackboard—virtually an animated blackboard, brought into operation by pressing a switch. However, the details of design of such a machine are rather beyond the scope of this article.

A point recognized by the British Film Institute is that so many existing machines are spoilt by being built down to a weight—no doubt adequate for the amateur who will be using it once or twice a week, but insufficiently sturdy for regular daily use.

Professional Mobile Machine

Any mobile machine must inevitably be a compromise between many conflicting requirements. But on three points I would have no compromise at all: the mechanism must be built on sturdy castings, not on sheet metal; the gate and intermittent motion must be rigid and accurately machined, designed to make allowance for the frailties of the film with which we have to work; and in the soundhead, lightness must be a consideration secondary to quality of reproduction. Due allowance must be made for the fact that, since the speed of the film is lower than that of the 35-mm film, and since the prime source of disturbance—from the perforations—is at 24 cycles per second instead of 96, the moving parts must be correspondingly weightier in relation to the mass of film to be moved.

Next, let us try to visualize the ideal mobile machine for the professional user, to whom it represents not a hobby nor a valuable tool for occasional use, but a livelihood.

First of all, he will almost invariably be required to run full-length programmes, therefore he will require two projectors. Why should not these two projectors be built into the one housing, right-hand and left-hand, or one above the other? (An example of the latter construction was seen in the Philips 35-mm dual projector.)[7] They could be driven by a single motor, with separate clutches, and would be less cumbersome, and easier and quicker to install and run single-handed than two altogether separate machines. Each machine would be required to run only 800 feet of film at a time—an ordinary double reel—which is in many respects more satisfactory than the 50-minute reels often used.

Some slight adjustment of the lenses would be required to superimpose the two pictures on the screen, but the principal adjustments for alignment would be common to both machines. Since the dual machine would be fairly weighty, it would be essential to have some mechanical means for centering the picture, both sideways and vertically. An efficient changeover system must be embodied, preferably employing a single control knob.

While the discharge lamp when perfected would be an ideal light source, provision must in the meantime be made for 1,000-watt lamps, of either the 25-hour or 100-hour type, or alternatively an arc. Adequate cooling arrangements are essential. Further, since filament lamps usually fail without warning when switched on, provision should be made for a spare lamp to be slid into position, pre-focused, without delay. A useful addition would be a trip counter on each machine which could be reset when a new lamp was fitted, and would so indicate the age of the lamp.

A vexed question with any type of mobile projector is, to what extent should it be made adaptable to different forms of electric supply? Fundamentally, this must remain a matter for the purchaser to decide, in the light of his probable requirements, since a universal machine must naturally cost more than a machine constructed to run on a.c. only. On the other hand, there are many out-of-the-way situations where d.c. only is available, generally at 200/250 volts, and, worst of all, at 100/115 volts.

A valuable arrangement is provided in one existing projector, in which the amplifier and motor are constructed to run on 200/250 volts a.c. or d.c., and a resistance is provided to step down the lamp voltage to the customary 110v. (A 200v. lamp is impracticable because of its lower efficiency and greater fragility.)

For 110v. supplies, the lamp is simply run direct on the mains, and either a transformer or rotary converter is interposed in the circuit to provide the higher voltage for the motor and amplifier. There is I know considerable prejudice against a.c.-d.c. amplifiers, but in my experience this particular amplifier has proved most reliable. There is the inherent objection to a universal motor, that it lacks the speed constancy of either an induction motor or a compounded d.c. motor, and this must be overcome by the use of a sturdy motor and reliable governors.

One thing I would urge upon designers: to reduce to a minmum the amount of electrical gear inside the projector case. With the best design, it seems impossible to prevent oil seepage on to the wiring, and oil is a deadly enemy of rubber insulation. Provision for the amplifier should be made on the projector stand, connected to the photo-cells by a few inches of screened low-capacity cable.

Plugs and Switches

Mention of cable brings me to the biggest bugbear of all mobile projectors, that is, plugs. Every projectionist who has run mobile equipment, whether 35-mm or 16-mm, will agree that 90% of all electrical faults are due solely to defective plugs and cables.

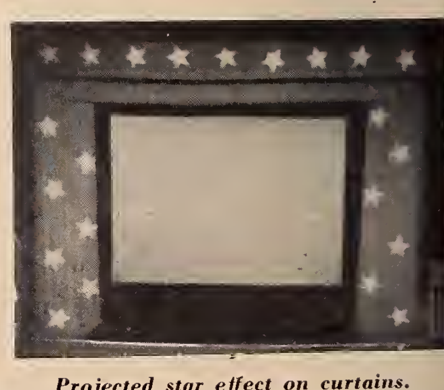
In a long experience with all types of plugs and sockets, I have found only one type that is reasonably satisfactory, and that is the recently introduced type in

(*Continued on page* 24)

Projectionist Dresses Up His Show

AUDIENCE appeal of the Biltmore Theatre in Kingston, Ont., Canada, is strikingly increased by the initiative of projectionist Fred Bendell, member of I. A. Local No. 528. Using a slide projector, with an 11" single lens to flood the entire stage opening, Bendell achieves attractive projected decorations as a setting for feature pictures.

By punching stars in colored gelatine with a star punch designed by himself and made by a local machinist under his direction, and then placing the cut-out gelatine between two glass slides, Bendell is able to surround his feature titles with star-spangled glamor. Warm colors, such as red or orange, are used during the winter months; and cool colors, such as green or blue, are used in summer. Variety is maintained. If blue is used for one feature, the second one is framed in green. The screen is not tinted—the screen area proper is masked out on the gelatine slide by means of a cardboard mask.



Projected star effect on curtains.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IN THE SPOTLIGHT

By *HARRY SHERMAN*

A SALUTE to the Canadian I. A. locals for their untiring efforts to bar women and girls from working in the projection rooms of motion picture theatres. Despite the many attempts made by theatre owners to introduce female projectionists in their theatres, the Canadian unions have steadfastly blocked all efforts to grant them licenses as full-fledged projectionists (or projectionettes). Although in some instances women and girls have been employed as apprentices, their chances of becoming licensed projectionists are very slim indeed.

We can understand the anxiety of the exhibitors to place women in their projection rooms, for it would be but a first step toward the breaking down of all gains made by the organized craft during the past years. No, our Canadian brothers are wide awake and on the watch for all subterfuges resorted to by these wily exhibitors.

● The establishment of a national school of electronics in connection with the Engineering College of Marquette University in Milwaukee, Wis., is the result of arrangements recently concluded between the University and the International Brotherhood of Electrical Workers. This school will give free courses in all phases of the electronic arts to qualified members of the I. B. E. W. The first of the eight courses scheduled, each one to last about six weeks, will begin November first and will be in charge of two union instructors.

Each local union is expected to send at least one member to the school, paying for his transportation and keep while there. This member will be trained as an instructor in the rudiments of electronics and upon his return to his local will organize and conduct classes for the other members. It is expected that these courses will cost the International office about $30,000 per year, in return for which the membership will be prepared to branch out into other fields upon which the union has long cast covetous eyes.

● We received a very interesting letter from Ralph Ruben, son of the late Max Ruben, former business agent of Local No. 199, Detroit, Mich. Ralph is now serving as an army projectionist with our forces overseas, and he writes that his work is not in the line of amusement but is a very important contribution to the war effort. His working partners Frederick T. Perron, Lisbon, N. H., and Johnny Evans, Columbus, Ga., were projectionists in civilian life and are a couple of the very few really competent projectionists in service. Ralph writes that the projection room he works in is well equipped, well ventilated and quite roomy. The men work an eight-hour shift, three men to a shift.

Young Ruben visited these offices shortly before leaving this country and looking at him took us back many, many years—more than we care to admit. As a matter of fact, when we first made his acquaintance he was but a "twinkle in his father's eye."

● Congratulations to our working partner at the Paramount Theatre, Joseph V. McCarthy, on the birth of his first child—a boy weighing 7½ pounds. Joe is doing very nicely, thank you.

● Father Robert A. Boelcke, head of the Science Department of St. Mary's College, North East, Penna., paid us a visit several weeks ago. We had a most interesting talk with Father Boelcke who is very much interested in the art of projection, having dabbled in it since 1916, and is a first-class projectionist in his own right. We invited Father Boelcke to the projection room of the Paramount Theatre and he was very much impressed with the equipment on hand, cleanliness and

ATTENDING THE RECENT CONVENTION OF THE NEW YORK STATE PROJECTIONISTS' ASSOCIATION

The Projectionist Staff of U. S. N. T. C., Sampson, N. Y., left to right: ***P. T. Rossomondo, E. M. 1/c (L. U. 376); Sidney Siegel, E. M. 3/c (L. U. 306); Moe Schuchman, S. 2/c (L. U. 306); J. Spanier, F. 2/c (L. U. 306); H. Diechman, E. M. 2/c; Childs, S. 2/c; S. Salvino, S. 2/c (L. U. 306); R. G. Yeager, S. 2/c; H. Whirtley, E. M. 3/c (L. U. 353); S. Quinn, S. 2/c; Shannon, S. 2/c; A. Imperati, E. M. 3/c (L. U. 306).***

In the background, wearing a gob cap but betrayed by his civie tie, can be seen Morris Kravitz, L. U. 306 business agent, and in the center is I. P.'s Harry Sherman.

Top row, left to right: ***I. P.'s Harry Sherman; Glenn Humphrey, L. U. 337, Syracuse, N. Y.; P. A. McGuire, International Projector Corp.***

Bottom row, left to right: ***James J. Brennan, 4th I. A. vice-president; Chas. F. Wheeler, L. U. 108, Geneva, N. Y., and D. F. Harrington, L. U. 592, Saratoga Springs, N. Y.***

orderliness of the projection room, and with the presentation of the show.


Lt. M. R. Petrich

We extend our condolences to Frank Petrich, charter member of Local No. 521, Long Beach, Calif., who recently received word that his son, First Lieut. Michael Robert Petrich, pilot of a Marauder B-26, has been reported as missing in action over France since July 5.

Lieut. Petrich, who had been overseas since last December, completed more than fifty missions and was awarded the Air Medal with eight Oak Leaf Clusters. He entered the service October, 1941, serving for seven months with the Army Quartermaster Corps after which he was transferred to the Army Air Corps. Another brother, Harold E. Petrich, is an ensign in the U. S. Navy.

● I. A. vice-president William P. Covert, also business agent of Local No. 173, Toronto, Canada, was recently the guest of honor at a party given by the Halifax, N. S., local No. 680. Many prominent personages in the industry attended the party, among them being Charlie Dentelbeck, former president of the Toronto local, and now projection supervisor for Famous Players of Canada.

Incidentally, the Halifax local made it possible to knock the mortgage off their Labor Temple by a very generous donation.

● Elsewhere in this issue will be found a notice of the next semi-annual meeting of the S. M. P. E., scheduled to be held in New York City. We strongly urge all projectionists, particularly those residing in or near New York City, to attend the technical sessions, where matters relating to the latest developments in the industry are presented and discussed.

● Having cleared up most of the debris, Gene Atkinson, business agent of Local No. 110, Chicago, has begun to organize the theatre employes (service)—ushers, cashiers, and assistant managers. We predict that before long the entire theatrical industry in Chicago will be unionized, thanks to Gene, from the projection room down to the basement.

● Morris Roizman, president of the newest I. A. local, Film Editors and Cutters Local No. 771, New York City, is the film editor of the popular March of Time reels shown at most movie houses throughout the country. Roizman is at present negotiating the first wage contract for his local. Good luck!

● Houston S. Morton, chairman of the newly formed Television Educational Committee of Local No. 199, Detroit, Mich., was a recent visitor to the offices of I. P. We had several very interesting and informative discussions on many subjects pertaining to the welfare of the craft. Houston was particularly interested in television and its effect upon projectionists in the post-war days, and he showed a lively interest in the steps taken by various I. A. locals throughout the country in their educational campaigns.

We are of the opinion that under his able guidance the educational program of Local 199 will rank high among the progressive I. A. locals.

● Julius Mintz, member of Local No. 182, Boston, Mass., has been appointed chief projectionist at the M-G-M projection room in Boston. Mintz holds the rank of technical sergeant with the Massachusetts State Guard and is its official chief projectionist.

● Prolonged illness has forced Matt Kennedy, for the last nine years business representative for Local No. 273, New Haven, Conn., to resign from office. He is succeeded by Frank Perry.

● In these columns last month we railed a bit about the poor recognition given our craft for its part in the success of the various bond drives. We were gratified to read in the trade press that the chairman of the Fifth War Loan Drive in the Washington, D. C. area publicly commended Local No. 224, Washington, D. C., for its contribution to the success of the drive and for its purchase of bonds amounting to $6,000. Looks like we are going places, boys.

● Condolences to William Hartnett, business agent of Local No. 257, Ottawa, Canada, and to Solly Pernick, business agent of New York City local No. 1 on the loss of their mothers.

● We are happy to report that Lou Goldschlag, member of Local No. 650, Westchester, N. Y., has fully recovered from his protracted illness and is back on the job.


P. A. McGuire

In recognition of 25 years service with his company, P. A. McGuire of International Projector Corporation was recently presented with a beautiful gold wrist watch. "Mac" is very popular with I. A. men throughout the country and may be termed a roving ambassador of good-will for his company.

● Ralph Kessler, son of our very good friend, Abe Kessler, Local No. 306, New York City, is the arranger for the Irving Berlin show "This Is The Army" now touring the army camps throughout the world. When Berlin returned to this country recently he paid Abe a visit and reported that his son was doing a splendid job.


Paul King

Paul King, member of Local No. 521, Long Beach, Calif., took a leave of absence from the Atlantic Theatre where he was employed as projectionist, and is at present playing the tuba with the famous "Spike" Jones and his City Slickers Orchestra, now entertaining service men and women in camps overseas.

Paul writes that his company has toured many of the service camps in England and is at present playing in the camps in France, where movie star Edward Robinson and songstress Dinah Shore joined their outfit. We hope it won't be long when they will be entertaining our boys in Berlin.

● **Attention I. A. Local Unions in the State of Illinois:** Nine vice-presidents of the Illinois State Federation of Labor will be elected at the next convention which will be held in December. Sam N. Bonansinga, for the past 31 years business manager of Local No. 138, Springfield, Ill., is a candidate for one of these offices. He has the backing and endorsement of the labor movement in Springfield, and seeks the support of every I. A. delegate to the convention.

We will let Sam's record in labor circles speak for itself. In addition to his official duties in Local No. 138, he has been president of the Springfield Federation of Labor for the last four years. He is a member of the War Manpower Commission, and represents labor on the Appeals Board No. 12 of the Selective Service. He is a director of the War Fund Council, member of the Civil Service Commission, and also is a director of the Social Service Exchange. In our humble opinion a man with his experience should find a place on the executive board of the State Federation of Labor.

● According to a statement released by the National Fire Protection Association approximately 1,400 theatre fires were reported for the year 1942. Of course, this does not include the many theatre fires not reported—those that are quickly put out before they have a chance to

(*Continued on page* 29)

TELEVISION TODAY

XII. — Color Television

By JAMES FRANK, JR.

UP TO the present time most of the development work carried on in connection with color television has been conducted by engineers of the Columbia Broadcasting System.

The introduction of color into television is of considerable value in that the quality of the image observed is materially enhanced. In comparing color television pictures with corresponding black and white pictures it immediately is apparent that there is a greater sense of reality and a more life-like quality in the image. Furthermore, small objects appear to be more perceptible and details in general seem to be more clearly defined. Just as in motion pictures, the addition of color to the picture also seems to introduce a certain perception of depth.

It apparently is due to the increased ability of color to reproduce the contrasts and shadows as well as highlights and reflections in different hues, while the degree of the color saturation, which depends on the distance—especially outdoors—strongly enhances the three dimensional quality. These characteristics made it extremely desirable to devote a considerable amount of time to the development of a television system which would transmit and receive pictures in color rather than just in black and white.

Historically it is of interest to note that color television was first demonstrated by Baird in England in July, 1928. Later in July, 1929, the Bell Telephone Laboratories in New York demonstrated a system. The Columbia Broadcasting System first demonstrated its color system in July, 1939, and in August, 1940, finally broadcast over station W2XAB in New York City three-color, high-definition television pictures employing electronic scanning both on the transmitter and at the receiver. At first motion picture color films were used, and then later live pickup was employed. During the summer of 1941 a large number of broadcasts were made over station WCBW of the Columbia Broadcasting System, during which a number of field tests were conducted to determine the practicability of color television.

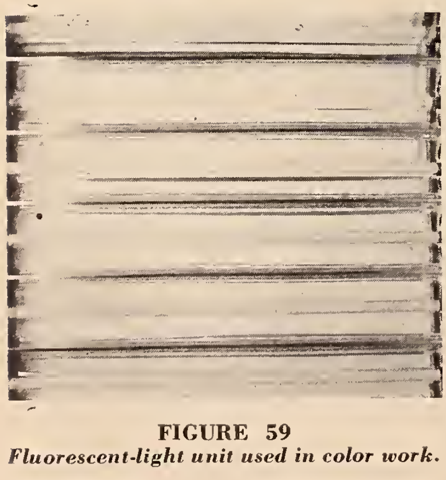


FIGURE 59
Fluorescent-light unit used in color work.

At the beginning of the study, a number of conditions were set down upon fulfillment of which depended the success of practical color television. These were:

1. For a given bandwidth the loss in monochromatic (black and white) definition due to the introduction of color should not be excessive.

2. The system should be based on three primary colors.

3. Within any given bandwidth, the performance of the color system decided upon should give at least as much satisfaction as the corresponding black and white system.

Tri-Chromatic System

A tri-chromatic system was chosen for color television based on the eye's retentivity of light of all colors and its ability to recognize mixtures of several colors as a single one. Theoretically, at least, all colors are reproduceable by a single set of three primaries. This same theory is the basis for color motion pictures.

The color is introduced into the picture through the use of suitable filters both in the camera at the transmitting station and the receiver.

The theory of the operation of a three-color television system can be simply described as follows:

1. The light reaching the light sensitive portion of the camera pick-up tube must first pass through one of the three-color filters. Thus, only the light waves in the red portion of the light spectrum will reach the pickup tube when the red filter is in front of the camera lens. The same is true for the green and blue filter.

2. The pickup tube converts only those light waves for each of the three primary colors reaching it at one time into electrical waves and transmits them to the television receiver. The filter disc or drum rotates with great rapidity so that it takes 1/120 second to scan the scene for each color or 1/40 second for all three colors.

FIGURE 60
View of a bank of fluorescent lights.

3. The receiver tube receives and converts to light waves the signal for each primary color successively in the same time period.

4. The light waves from the fluorescent screen on the receiver tube pass to the viewer through similar filters rotating on a disc at the same speed as that in the camera. If properly synchronized, the red light waves picked up by the camera are reproduced at the receiver just as the red filter is opposite the fluorescent screen. Thus, the viewer sees, for a brief instant, just the red portion of the whole scene. Directly after that he sees the green portion and then the blue portion.

5. By virtue of persistence of vision, the eye of the viewer actually sees the scene in full color because it retains the impression of each of the three color scenes long enough to mix them properly and discern the whole scene in all of its respective colors.

The primary colors at the receiver are determined by the color filters, red, green, and blue, and the fluorescent material in the receiving tube employed. It was necessary to determine exactly which shades of the three primary colors (red, green and blue) would produce the largest variety of colors. Making this determination, it was found that in television, as in certain other color reproducing processes, a compromise had to be found between light intensity and the best choice of primaries. Furthermore, there was a restricted choice in the available phosphors which are used in a receiving tube.

In view of the fact that the vertical scanning frequency is to be increased to 120 per second in order to use the three-color system, a problem arose in finding a fluorescent powder for the receiving tube with a decay time such that its intensity became negligible after one color field period or in 1/120 of a second. Of the commercially available phosphors the zinc and calcium sulphides possess sufficient luminescent efficiency, and also satisfy the decay requirements.

Of course, the luminescent spectrum of the phosphors should cover the entire range of the three filters in order to provide a suitable light source for each pri-

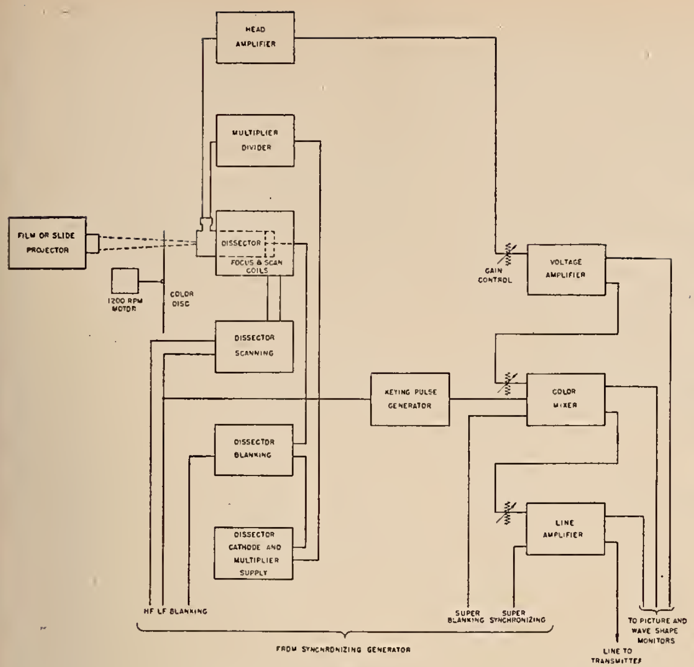


FIGURE 61

Block diagram of a color television transmitting system using dissector camera tubes.

mary color. This resulted in the use of a receiving tube employing two component mixtures utilizing a zinc-sulphide with a spectral emission maximum in the blue and blue-green region, and a zinc-cadmium sulphide with a maximum in the yellow and yellow-red region. The most suitable filters were found to be the Wratten series which are available in gelatin or acetate stock. It is desirable, of course, to have filters and phosphor so chosen as to produce white corresponding to daylight fluorescent lamps with equal signal on the grid of the picture tube during the red, blue and green periods. Thus if a white surface of say 6,000 to 6,500 degrees Kelvin is transmitted, it should be received as the same shade of white and also should be identical to the receiver's own color when operated without a signal.

Choice of Filters

The filters finally chosen for use at the receiver were Wratten No. 26 for red, No. 47 for blue, and No. 58 for green. A number of different types of receiving tubes were produced employing a phosphor of the characteristics described above. The range of colors obtainable with this choice of phosphors and filters is as large as is encountered in color photography.

The performance of the receiver was based on the color theory of vision, but the study of the color characteristics at the transmitting end of the system had to be guided by the requirements and desirability of producing all colors encountered in nature. This meant that at the receiver three properly chosen narrow bands in the color spectrum were sufficient, but at the transmitter the bands had to be wide enough, and sufficiently over-lapping to produce a signal from every color. The exact character of the three filters required at the transmitter was determined by the filters and phosphor combination chosen for the receiver.

There are a number of factors which control the choice of filters employed at the transmitter. The spectral sensitivity of the pickup tube in the camera, that is the relative sensitivity of the tube over the color spectrum, is one of these factors. Another, of course, is the transmission characteristic of the filters. The third factor is the spectral emission of the light source. In this case consideration had to be given to the fact that in some instances sunlight was being used; in another, a light source for interior live pickups; and in a third instance a source for the transmission of slides and motion picture film. It was also found to be extremely desirable to produce negligible systems in the infrared and near-ultraviolet region of the color spectrum.

As has been previously described, there are two types of transmitting tubes in general use. For color television the image dissector is used for slides and motion pictures and the orthicon, a recent development of the iconoscope, is used in studio and out-door pickups. It was found particularly important that with a dissector the signals produced with infrared radiation be eliminated. The infrared light contaminated all the colors passing through the filters. Special transmitting tubes were developed utilizing light sensitive surfaces that responded properly to the entire color spectrum. The dissector was used with a motion picture carbon arc light source, with suitable filters, and a water cell to minimize the heat. With both the dissector and orthicon, Wratten filters were likewise used similar to those in the receiver.

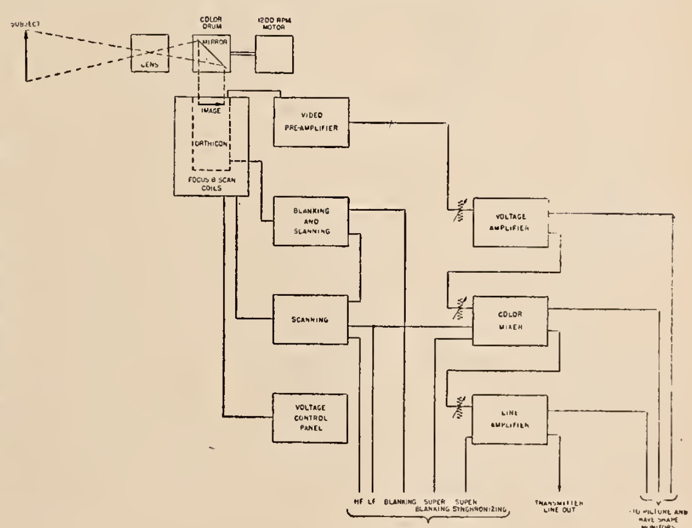
Light Source Important Factor

The color characteristics of the transmitting end of the system, as mentioned before, depend to a large extent upon the illumination source. For slides and motion pictures, the carbon arc is used and the filters are chosen to match the carbon arc. For direct pickup it is desirable to have a light source that will not necessitate the change of filters when the camera is moved out-doors.

It was found that a good approximation to such a light source could be obtained by using incandescent lamps with certain types of filters which practically eliminated infrared light. This type of light source, however, is very inefficient. Consequently fluorescent lamps of the daylight type were found to be more suitable. The lamps used contained 30 watt bulbs mounted in specially designed reflectors, and developed for color television to give the maximum light flux for a minimum ceiling area. A single unit is shown in Figure 59 and a bank in Figure 60.

FIGURE 62

Block diagram of a color television transmitting system using orthicon camera tubes.



The daylight fluorescent lamps have a characteristic which is down in the red and slightly down in the blue portion of the spectrum as compared to out-door illumination. It was found that when switching from studio pickup to out-door scenes, it is necessary to reduce the red signal by means of the electrical color mixer. The electrical color mixer is employed in order to compensate for different lighting conditions and for certain other effects.

An interesting fact that has been found in connection with the color television receiver is that these pictures do not deteriorate appreciably in the surrounding illumination of the room. This is due to the fact that the room light which passes through the filters twice is considerably diminished by them. Consequently, the image that is visible on the unmodulated screen is nearly black even in a well illuminated room. Thus color television pictures with an intensity somewhat lower than that of a black-and-white picture, may be found to be more satisfactory.

The introduction of color has not required many changes in the design of television studio equipment. However, the use of a color field frequency of 120 per second does necessitate complete freedom from 60 cycles a.c. hum. Hum may be eliminated solely by operating the equipment from 120 cycle a.c. power supply. This is not generally practical, and other means sometimes have to be taken to minimize hum.

Figure 61 shows a block diagram of a color television transmitting system using dissector camera tubes and Figure 62 is a block diagram of a color television transmitting system using orthicon camera

FIGURE 63
Orthicon camera on tripod used for direct pickup.

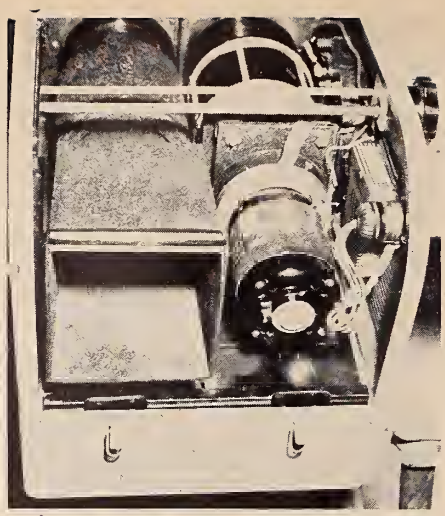


FIGURE 64
Orthicon color camera; inside view showing filter drum with synchronous driving motor.

tubes. The orthicon camera on a tripod used for direct pickup is seen in Figure 63. Figure 64 shows an inside view of the orthicon color camera with the filter drum and synchronous driving motor seen in front. Another view of this filter drum is shown in Figure 65 and here the filters can be easily seen mounted in the drum which is rotated by the motor.

The use of such a drum is quite practical with the orthicon camera since the

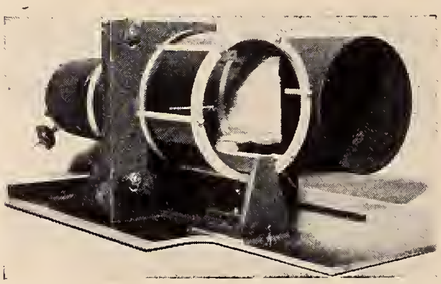


FIGURE 65
Orthicon color camera; filter drum assembly.

orthicon itself, being of the storage type, requires that only one color can be presented in the optical image for one complete scanning field period prior to the actual scansion of a given point. While it is possible to accomplish this with a disc, the use of a drum minimizes the space required and the contamination of colors. The drum is phased so that the shadow of the slotted rods holding the filters follows the scanning light.

The principle difference between a black-and-white television receiver, and a color television receiver is a color disc with its driving and synchronizing means. Figure 66 shows a front view of a 9″ color television receiver and in Figure 67 we see this same receiver with the top open. In this illustration the color disc with filters can be seen on the right-hand side between the receiving tube and the viewer. The motor driving the disc can be seen on the right-hand side connected by a shaft to the disc.

Special precautions have to be taken in the receiver to insure freedom from hum. The cathode ray tube is, therefore, shielded. In addition, a number of other precautions are taken. If objectionable hum is present in constant phase and am-

(*Continued on page* 27)

FIGURE 66
Front view of 9″ color television receiver.

CHANGE METHOD FOR CLEARING OF NEW THEATRE APPLICATIONS

The War Production Board announces a change in its method for clearing applications for authority to construct theatres, stating that all applications, as of August 19 will be referred to WPB in Washington. Heretofore applications for construction of theatres involving less than $100,000 were processed by WPB field offices, while only those involving more than $100,000 were sent to Washington for approval.

Applications still must be filed in the WPB field office in the area where the project would be located, and field representatives will review them and then send them to Washington with their recommendation. Field offices may deny applications or recommend approval, but actual approval of any project must came from WPB in Washington, it is pointed out. The new method applies to all new theatres, rebuilding of theatres damaged or destroyed by fire or other casualty, or conversion of any type of building to theatre use.

EQUIPMENT DEALERS TO MEET IN CHICAGO OCT. 6-8

The Theatres Equipment Dealers Protective Association will meet in Chicago Oct. 6-8, at the Hotel Bismarck instead of Oct. 20-22, Ray Colvin, president, announces. Invitations bearing the new date have been sent all dealers and manufacturers of theatre equipment.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

An Improved Wrench for Allen and Bristo Set Screws

Tightening the Allen set screws on motor couplings, and Bristo screws on Erpi motor couplings requires the use of an Allen or a Bristo wrench and usually a pair of pliers. There is little room to work in and it is an awkward job.

Recently I purchased a 6-inch fairly heavy screw driver with a plastic handle. I sawed off the blade, chucked the handle in a lathe and drilled a hole in the shank of proper size to take the Allen or Bristo wrench. Then I cut off the short end of the wrench, and after insertion in the shank of the screw driver I brazed it in place. If the work is done carefully, the temper of the Allen wrench is not lost. Total cost was 45c for the screw driver and 50c for the use of the lathe and torch. Now I am sure all of my motor coupling set screws will be kept tight.—TED DEVORE, *RCA*.

Removing Excess End Play in Soundhead Motors

An excellent and permanent method of removing excessive end play in soundhead motors is to remove the dust plug from the end bell and cut a thin slab of cork the desired thickness, oil it and place it between the dust plug in the armature shaft. Since it will constantly be oiled from the bearing, it will outwear several metal shims.—H. W. PROSSER, *RCA*.

Correct Method of Using Stranded Wire

Most if not all stranded wire is twisted counter-clockwise when made. Practically all right-handed people twist the wire clockwise to tighten the strands before soldering or connecting. If the wire is twisted counter-clockwise, not the normal way, connections hold up better since breakage tendency is lessened, particularly in cases where removal of connection is frequent.—R. H. BISBEE, *RCA*.

Emergency Replacement Spring

Recently I had occasion to change a broken half-moon spring in the MI-9050 soundhead. These springs are also used in the lower and upper idlers of the MI-9050 and MI-9001 soundheads. I did not have a new spring on hand, so I made a very good substitute by removing the point and clip from a safety pin and bending both ends. This worked satisfactorily until a new spring was obtained. —JOSEPH MILLER, *RCA*.

Lubrication Hint

Solder a wire in the end of the oilcan spout. This will guide the drop of oil to the exact point desired and the wire can be bent to guide it into the hard-to-get-to spots.—R. H. HECHT, *RCA*.

Eye Protection for Projectionists

A small piece of colored gelatin placed over the tiny mirror that reflects the image of the carbon arc to the paper screen on the top of the lamphouse will have little effect on the brilliance of the image, but will soften it to a point where it will not be irritating to the eyes. It is suggested that a light green be used for greatest eye protection—C. R. SHEPARD, *RCA*.

ERRATUM

To the Editor of I. P.:

As my old friends in Altec may be embarrassed by an erroneous statement which appeared in one of their contributions to the "At Your Service" page of the July 1944 issue of I. P., I am pointing it out simply because of the rarity of errors in our standby—I. P. Most of my old cronies and working buddies believe what they read in your worthy magazine down to the last dot, so I think a note on the correction would be in order, eh?

On page 29 of the July issue, under the heading "Strobo Disc for Checking Speed on Machines," there appears a calculation for a negative six revolutions per minute of the disc as follows: $\frac{354 - 6}{360} \times 90 = 88.5$ feet per minute. The expression should have been $\frac{360 - 6}{360} \times 90 = 88.5$ feet per minute.

Your publication is improving steadily on its excellent old-time standard, and I still receive immense benefit from reading it. Keep up the great work.

JOS. F. HOLT, (*Member L. U. 692*)
Signal Sec. Sub. Depot. Co.
APO 869, c/o PM, Miami, Fla.

[*A salute to Brother Holt for discovering this error. As a matter of fact the Altec item as submitted to this office contained the correct expression, noted above, but the error was due to faulty proof-reading.*—ED.].

Correction of Intermittent Increase in Volume

All field engineers are familiar with the complaint of intermittent dropping of volume, but when one gets a complaint that the volume is soaring to uncontrolled heights, when you still get too much volume on zero, then that's a horse of another color.

In one instance the trouble was finally located as an intermittent capacitor in the feed back circuit. When the capacitor, which was used as a coupling capacitor in this circuit was working properly, it held the overall output down to normal and the volume could be controlled nicely with the volume control amplifier controls. But when the capacitor opened up, the overall volume of the system increased 20% to a point where the volume controls couldn't handle it. A new capacitor corrected this condition and things are now back to normal.—C. R. SHEPARD, *RCA*.

Improving Scanner Action on the 209 W. E. Soundhead

Uneven scanner in the No. 209 W. E. soundhead was traced directly to the drive belt on which, after being in service for about three weeks, a high spot would show itself. This belt was replaced with a 13 x 16 Gates Truex belt which has been in service for the past four months with excellent results.—G. E. REIGER, *RCA*.

Emergency Exciter Lamp Supply

Upon answering an emergency call recently, I found the primary burned out of the exciter lamp transformer on the soundhead. Being in a remote area, I was unable to obtain a new transformer immediately to replace the damaged one. By connecting the exciter lamp across the voltage taps in the primary of the transformer on the arc rectifier, I was able to obtain the necessary 8.5 volt a.c. —L. W. JONES, *RCA*.

DESIGN OF SUB-STANDARD SOUND PROJECTORS

(*Continued from page* 16)

which the pins or sockets are embedded in soft rubber, to which the cable sheathing is vulcanized, making the cable and plug a single unit. These, however, are not entirely trouble-free, chiefly due to the pins being made of soft material and not making sufficiently good contact with the sockets. Another fault of this type of plug is the difficulty of repair should the cable fail.

The ideal mobile projector should be constructed without the use of flexible cables or plugs. Let the stand contain the electrical controls, making contact with the projectors through spring contacts; the latter would need careful design, but given this most of the worries of the mobile projectionist would be at an end.

A vital requirement of any mobile projector is silent running. The principal sources of noise are:

1. The motor.
2. The cooling system.
3. The intermittent motion.
4. Gear drives.
5. Transformer and other A.C. hums.
6. The amplification of such noises by large unsupported surfaces.

The only way to reduce motor noise is by reducing the speed of the motor, which in its turn necessitates a heavier and bulkier motor; there is obviously a limit to which such improvements can be carried. Some improvement can be effected by careful balancing of the motor windings.

High-speed fans must be avoided. Low-speed turbine fans are reasonably silent, but are again bulky, proper design of air ducts and the avoidance of sharp bends should help.

In the silencing of the intermittent motion, probably the chief factors are the avoidance of abrupt acceleration and deceleration, and the absence of play in the working parts, which, of course, entails a high standard of workmanship. Gear noise can also be reduced by good design and workmanship—the use of coarse-pitch non-metallic spiral gears, as far as possible running at low speed and properly meshed. Transformer hum can be minimized by sound design and construction.

In conclusion, I have been asked to say a word on the conversion of silent sub-standard projectors to sound. My advice can be contained in one word: *Don't*. If you must, remember that the motor was not intended to drive a sound-head, nor to maintain the speed constancy necessary for sound, so provide another motor which should drive the projector from the sound head, and not *vice versa*. Chain drives must be avoided

in spite of their convenience. Gears must be kept to a minimum. I am aware that successful conversions have been made, but it is not to be expected that a quality of sound comparable to that of a specially designed machine should be attained.

DISCUSSION

Mr. A. G. Peppy: Why should we necessarily follow the American practice of running the lamp on 110 volts? Why not a lower voltage, which would give greater efficiency? In regard to your suggestion to construct the mirror and condenser inside the envelope, while you would no doubt increase the optical efficiency, the difficulty is to produce mirrors and condensers that would stand up to the intense heat.

Author: No doubt lower voltage lamps would be rather more efficient; an objection is the increased current which would need heavier leads and plugs. Existing lampholders are not good enough. I should like to see the bi-post cap adopted for all high-powered lamps.

On your second point, surely a lamp was made, running on 15 volts, with a silvered bulb. I should have thought that glass that will stand up to the heat of a powerful arc could be safely used in a filament lamp.

Mrs. A. E. Cotton (*contributed*): A temperature of 500° C. is by no means an extreme temperature for ordinary heat-resisting condensers. Inside the bulb, of course, the condenser would be immune from draughts, which are ordinarily the chief trouble, rather than the mere temperature.

Mr. F. C. Smith: In the design of 16-mm projectors, I have had more trouble with lampholders and mirrors than with all the rest of the instrument. Optically you have a much more delicate problem than with 35-mm film. Mr. Cricks referred to the accuracy of speed to which the film has to be controlled. It seems to me for this reason that portable equipment is unlikely to be really satisfactory in the future.

Mr. A. I. Morgan: The problem of flicker in the discharge lamp when run on a.c. would be overcome if the film speed were increased to 25 frames per second.

Author: That is a suggestion I have previously made. I am in favor of it.

Mr. P. A. G. H. Voigt: The increase in speed of the picture by 1/24th would not be noticed, but your music would be out of pitch. Some people have an absolute sense of pitch and are very susceptible to such changes.

Mr. Townes: Development of 16-mm projectors should proceed towards the production of a machine that will run a full feature. It is possible to run a complete programme on a single reel, even with a 750-watt lamp.

Author: Many people using 16-mm machines do not take sufficient care of their machines; you may get scratches running through the whole feature. The question of gate cooling must also be overcome.

Mr. Heller: A power rewind is a necessary part of a 16-mm machine. Time is important, and it should rewind at a fair speed.

Author: A separate rewinder is better.

Mr. Richards: A word about film damage. My experience is that the claw movement is not the prime factor, but incorrect design of gates and facilities for threading. Too much stress is put on the film damage angle. I have run sub-standard films on the Continent: I ran one film for two months, four or five times a day, without damage. Film shrinkage is one cause of trouble. Stock manufacturers should be able to prevent shrinkage. Trip switches are a bugbear.

Author: I disagree from my experience, you cannot lay too much stress on the avoidance of film damage. In regard to trip switches, it is certainly annoying to have the machine frequently going black, but it is better than tearing the film.

Dr. Ward: I endorse Mr. Cricks's views on the need for the avoidance of film damage. A point in which I have found trouble

is the take-up; this seems to be perpetually giving trouble.

Mr. I. D. Wrattens: All sub-standard films are of course on acetate base. But it does not matter what your film is made of if the projector is working under bad conditions.

Mr. E. D. Eyles: You get more shrinkage with acetate. The tolerance that can be allowed with the single claw is greater than in the case of 35-mm where two or three teeth of the sprocket engage.

Mr. W. Harcourt: 16-mm is run in the reverse manner to 35-mm—the emulsion on the bearing surfaces of the gate.

Mr. Richardson: Why should not the emulsion of 16-mm films be hardened in processing to the same extent as 35-mm?

Mr. I. D. Wratten: The positive emulsion is exactly the same emulsion as on nitrate base. The hardening of the film is dependent on the fixing and hardening bath.

Mr. Townes: The trouble with green 35-mm film is just as bad as with 16-mm film. The effect of processing is to polish the surface. The bulk of film damage is done in the first few runs. I do not blame the gate to the extent that I blame the sprockets and cradles, which leave a lot to be desired. Damage is often caused by the leaders getting in a bad state of repair.

Authors Whether damage occurs on the sprockets or elsewhere, it is manifested in the gate.

Mr. H. D. Waley: Should not the gates of 16-mm projectors have pressure adjustment?

Author: That surely depends on the user; there is a risk in allowing him to provide excessive tension.

A Visitor: Is it possible to improve the optical system of the sound gate?

Author: It is rather a difficult proposition. If the slit of a 35-mm machine is .001 in., then the slit of a 16-mm machine should be only .0004 in. It is exceedingly difficult to focus to such fine limits, and anyway, halation and scatter make the effective width of the slit much greater. Of the two types of optical systems. that in which the slit is projected on the film, and that in which the image of the track is projected on the slit, the second is probably rather better from this point of view.

Mr. N. Leevers: I am sure that much of the low quality of sound in 16-mm is due to the poor speakers sometimes used, and to poor acoustics. Some manufacturers of 16-mm reproducers seem to have forgotten all about the loud-speakers. A small moving-coil speaker in the box would help the projectionist to hear and judge his sound.

Author: We expect 16-mm sound to come through a single speaker, instead of the banks of speakers used in the kinema.

Mr. Townes: When we started on sub-standard sound, why did we not revise the position of the track in relation to the picture? If the sound were reproduced at a point above the picture, you would do away with the necessity for expensive fluid-flywheel systems.

Author: Surely you would need the same means of isolation from the intermittent movement in the gate. and of accurate smoothing.

Mr. P. G. A. H. Voigt: It is absolutely necessary to separate the intermittent movement of the film from the part that must run smoothly.

REFERENCES

1 *Ideal Kinema*, Nov. 1943.
2 *B.S.S.*, 667 of 1942.
3 *J. Soc. Mot. Pic. Eng.*, Oct. 1942.
4 *J. Brit. Kine. Soc.*, Jan. 1941.
5 *Proc. Brit. Kine. Soc.*, No. 39. 1936; *J. Soc. Mot. Pic. Eng.*, April 1937.
6 *Brit. Film Inst.*, 1943.
7 *J. Brit. Kine. Soc.*, July 1939.

TELEVISION TODAY

(*Continued from page 22*)

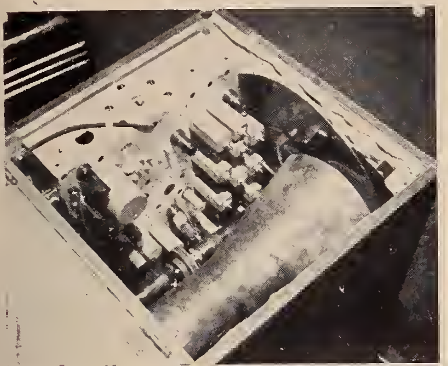


FIGURE 67

9" color television receiver; top view, open.

plitude, it is then sometimes possible to eliminate it by injecting a similar hum in opposing phase. Interference also is sometimes produced due to electro-static charges which accumulate on the rapidly moving color discs. Movement of the scanning lines is sometimes caused by variation in the charge over the surface of the disc as the disc rotates. It is possible to remove the charge with a semi-conductive coating on the cathode ray tube face, or by other means.

Color discs have been made of metal or of transparent plastics such as lucite, plexiglass, etc. Wratten filters are available coated on 10/1000" acetate stock which can be riveted to the metal or plastic disc. The disc may be rotated by a synchronous motor, or by an asynchronous motor with auxiliary synchronizing means. Owing to lack of synchronism between the power supplies of New York, Connecticut and New Jersey, and also to the lack of standard synchronous motors of 1,200 revolution per minute type, it was found desirable to drive the disc with an inexpensive induction type motor and synchronize it by a phonic motor, or a magnetic brake. A photograph of a brake assembly as used on a 7" color television receiver is shown in a rear view in Figure 68. The induction motor driving

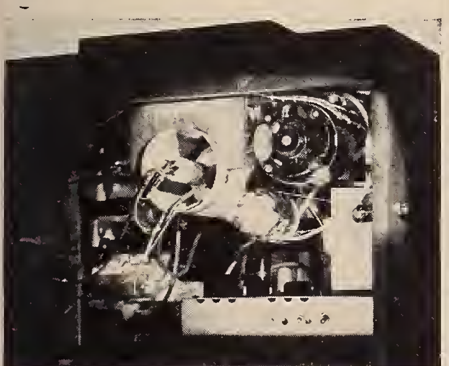


FIGURE 68

7" color-television receiver showing synchronizing brake and driving motor assemblies.

STREUBER NAMED SALES MANAGER FOR RCA THEATRE EQUIPMENT

Karl Streuber has been named theatre equipment sales manager for the International Department of the RCA Division, Radio Corp. of America, it is announced by Jay D. Cook, managing director of the department. Mr. Streuber, who is widely known in the export field, has been engaged in export sales of theatre equipment, and with this background assumes charge of the department's expanding foreign sales operations in the theatre field.

The appointment is in line with a recent announcement that a complete line of motion picture equipment will be made available through RCA to exhibitors in countries outside the United States. The equipment which will be supplied through RCA's distributors will include projectors, arc lamps, screens, power supply apparatus, chairs, and diversified range of accessories, in addition to RCA sound reproducing systems.

NEW FILM CEMENT ANNOUNCED BY BELL & HOWELL

A new film cement perfected by Bell & Howell Co. is said to have greater tensile strength, with the material in the bottle being completely stable, with no deterioration to be expected other than that by evaporation of any solvent of like drying time. Also, there will be no attack on the cork, it is said, and the material is not corrosive. The cement may be used for all motion picture film, both acetate and nitrate.

(*Continued from preceding page*)
the disc is shown in the upper right-hand corner with the brake slightly below, and to the left of it. The 120-cycle voltage is derived from the low frequency scanning circuit and is mixed with a similar

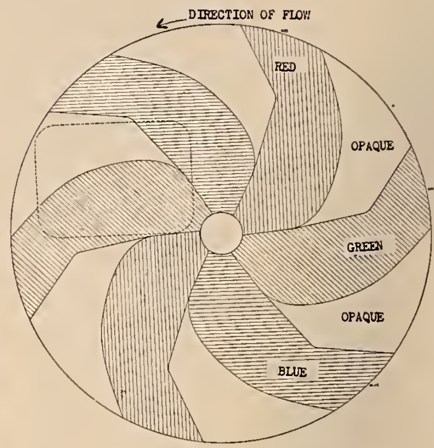


FIGURE 69
Typical receiver filter-disk design.

voltage from a small generator on the disc shaft. The sum of the voltages is then rectified and the resulting direct current applied to the magnetic brake. A departure in the disc phase with respect to the scanning produces a corresponding correction on the part of the brake. The disc diameter in a receiver is about twice the outside diameter of the receiving tube, plus one or two inches. The best location will be determined by such factors as the distance from the disc shaft to the picture frame. A typical filter disc for a receiver is shown in Figure 69.

Color television is as yet by no means perfected. Developments will continue for sometime to come, and it is interesting to note that in all television standards that have so far been adopted provision has been made for the addition of any standards that may be necessary in order to properly care for the requirements of color television. Some consideration is also being given at this time to other methods of designing color television systems which are entirely electronic in nature, but which have not yet been sufficiently developed to permit description at this time.

IN THE SPOTLIGHT

(*Continued from page 19*)

spread. We failed to find any mention of the number of projectionists lost or injured in these blazes, nor was any figure given for the number of patrons killed or injured. However, we did note that the estimated fire loss amounted to $2,500,000!

Highlights of the 10th District and N. Y. State Proj. Ass'n Meetings:

Despite an injury received while puttering around his summer home, H. Paul Shay, the newly elected secretary, was very active. In addition to his duties as a projectionist in his home town, Elmira, N. Y., Paul edits the local labor paper and does a mighty fine job.

Leo Curry, Binghamton Local No. 54 business agent, has a fine sense of humor and is the life of the party at every affair he attends.

Tom Murtha, business agent, Local No. 4, Brooklyn, delivered an excellent report on the activities of the War Manpower Commission as they affect our members in the 18-45 class. A copy of this report should be in the possession of every I. A. local.

Joe Dwyer, the popular president of Local No. 1, New York City, attended the meeting and looked fit as a fiddle. Joe had just left a hospital bed where he had been confined for four weeks suffering from some ligament trouble, but seemed to be in tip-top shape at the Syracuse meeting.

Phil Rossomondo, member of Local No. 376, Syracuse, and now chief projectionist at Camp Sampson, N. Y., attended the N. Y. State Projectionists' meeting accompanied by 13 members of the Camp Sampson projectionist crew. (See photo elsewhere in this issue.)

Ada Nelligan, Theatrical Wardrobe Attendants Local No. 764, and secretary of the 10th District Resolutions Committee, was the lone woman delegate. Ada has attended many I. A. conventions and is highly regarded by the delegates.

Syracuse Local No. 376 played host to all the visiting delegates at a midnight supper—with entertainment. The party broke up in the wee hours of the morning and a swell time was had by all.

● For the benefit of those of our readers who evidently are unfamiliar with the function of a craft publication, we repeat that I. P. will not enter into any discussions pertaining to political or racial matters. This magazine is published solely to further the interests of the craft and we shall continue to present to our readers such technical and semi-technical articles that we believe will prove of inestimable value to them in their work.

If any of our readers have an axe to grind or are dissatisfied with the policies of the I. A., we suggest they have their appointed delegates take these matters up on the floor of the I. A. conventions—this magazine will not take part in any controversial issues.

● We were shocked to learn of the sudden death of Fred Chesbro, for many years a member of Local No. 290, Gloversville, N. Y. We had a very interesting chat with Fred at the St. Louis Convention several months ago and he seemed then to be in perfect health. We sympathize with his widow and baby.

Keep Backing the Attack
BUY WAR BONDS

N. Y. State Proj. Ass'n Elects New Officers

DENNIS F. HARRINGTON, business representative Local No. 592, Saratoga Springs, was elected president of the New York State Association of Motion Picture Projectionists at its recent annual meeting. Earl Tuttle, Local No. 396, Binghamton; Melvin Denny, Local No. 376, Syracuse; and John Short, Local No. 480, Corning, were elected vice-presidents, and Charles Wheeler, Local No. 108, Geneva, secretary-treasurer.

William Stevens, Local No. 484, Olean; E. T. Stewart, Local No. 306, New York City; H. Paul Shay, Local No. 289, Elmira; Ralph Hayes, Local No. 338, Watertown; and Glenn Humphrey, Local No. 337, Utica, comprise the new Legislative Committee, and the newly elected Executive Committee members are Richard Hayes, Local No. 650, Westchester; Wm. Axton, Local No. 524, Glens Falls; B. F. Willoughby, Local No. 313, Amsterdam; William Colquhoun, Local No. 121, Niagara Falls; and Herman Gelber, Local No. 306, New York City.

Harry Sherman, Local No. 306, New York City, was elected delegate to the State Federation of Labor, and Francis Larham, sergeant-at-arms.

RCA PERSONALS

Home office executives of RCA's Industrial and Sound Department and the RCA Service Company recently held conferences in the Indianapolis plant in connection with equipment design and production plans for 16-mm motion picture sound and projection equipment. Included were Edward C. Cahill, David J. Finn, Barton Kreuzer, Homer B. Snook, O. V. Swisher, A. G. Petrasek, H. J. Benham and Edward Stanko.

Pickney Reed, field engineer of the RCA Service Company, has returned to the U. S. after nearly a year in Brazil, and is with the Naval Research Laboratory in Washington. James L. Cost has returned from the Canal Zone, and is back in theatre service activities in the Dallas District. Also returned from the Canal Zone is Robert Cobble, who has been assigned to the U. S. Navy Yard at Charleston, S. C.

NEW HIGH IN REGISTRATIONS FOR ELECTRONICS PARTS MEETING

Attendance at the Electronic Parts and Equipment Industry Conference to be held at the Hotel Stevens, Chicago, Oct. 19-21, will run well over a thousand, according to the sponsoring organizations. Registrations already run over a thousand. Conference booths will be available for manufacturers, where they can meet with jobbers and others for business discussions. No displays will be permitted.

The conference is sponsored by the Association of Electronic Parts and Equipment Manufacturers; the Sales Managers' Club, Eastern Division; the National Electronics Distributors' Association, and the Parts Division of the Radio Manufacturers' Association.

S.M.P.E. AWARDS TO BE MADE AT DINNER-DANCE

The Progress Medal Award and the Journal Certificate for 1944 will be presented by the Society of Motion Picture Engineers during its 56th semi-annual technical conference at the Hotel Pennsylvania, New York, Oct. 16-18. The awards will be made at a dinner-dance to be held in the Georgian Room on Oct. 17.

W. C. Kunzmann, convention vice president, in announcing the tentative convention program, states that it includes business sessions on each of the three days, starting at 10 a.m. Evening programs also are being arranged.

Committee chairmen include: Barton Kreuzer, papers; R. C. Keith, Atlantic Coast Section; W. C. Kunzmann, registration and information; E. I. Sponable, reception and local arrangements; D. E. Hyndam, dinner-dance; James Frank, Jr., membership and subscription; O. F. Neu, hotel and transportation; Mrs. E. I. Sponable, women's reception; H. F. Heidegger, 35-mm projection; M. W. Palmer, 16-mm projection, and Julius Haber, publicity.

RCA CONTRACT RENEWED BY FOX THEATRES

RCA Service Company announces the signing of renewal sound service agreements covering more than 300 theatres by the Fox Theatre groups. This will bring RCA's ninth consecutive year of service to the theatres, which are located in Wisconsin, the Rocky Mountain Region, on the West Coast, and in the Pacific Northwest.

JOHN M. STAHR PASSES AWAY

John M. Stahr, comptroller of manufacture for the Western Electric Company, passed away suddenly on Aug. 15 while on vacation at Lake Minnewaska, N. Y.

Mr. Stahr was born in Voldum, Denmark, and came to the United States as a child and after attending public schools entered Rutgers University, from which he graduated in 1906 with an A.B. degree, and was elected to Phi Beta Kappa. He joined Western Electric soon after graduation, spending his entire business career with the company with the exception of a period during the first World War when he served as a civilian employee of the Signal Corps.

After entering Western Electric's accounting department in New York as a clerk in 1906 he advanced through various positions of responsibility and in 1914 was transferred to the Hawthorne Works in Chicago where three years later he became Works' accountant. In 1936, he was promoted to comptroller at Hawthorne, and in 1942 he became the company's comptroller of manufacture at headquarters in New York.

Mr. Stahr is survived by his widow, the former Aagot Amundsen, and three children, James in V-12 of the Navy at Villanova; Robert and Audry. The Stahrs made their home in Summit, N. J.

General Precision Acquires Ampro

CONTROL of Ampro Corp., Chicago, has been acquired by the General Precision Equipment Corporation, New York, it is announced. Ampro is one of the well known manufacturers of motion picture projectors for the 16-mm and 8-mm film. Earl G. Hines, General Precision president, states that the acquisition was for cash, but no new stock of the parent company will be issued in connection therewith, and that the present management of Ampro will continue to be in charge of operations.

Other General Precision subsidiaries long have been leading manufacturers of standard 35-mm motion picture equipment for theatres but have not made 16-mm or 8-mm film equipment.

Mr. Hines, in making the announcement, said that "with the acquisition of Ampro the motion picture activities of General Precision will now include apparatus covering not only the professional 35-mm field, but also the requirements of 16-mm and 8-mm equipment for use by educators, industry and home movie enthusiasts. Thus the products will cover the complete range of equipment for motion picture projection. Other related equipment such as 16-mm and 8-mm cameras will be added when war activities cease and such development programs can be undertaken."

Approximately 15,000 16-mm projectors now are available in U. S. schools and considerable expansion of this equipment is contemplated. Some industrial companies long have used 16-mm film as sales stimulators and during the war period training films for employees have aided in increasing production. It is believed that such uses of motion pictures by industry will be expanded greatly in the post-war period. For home or amateur use the demand for 8-mm silent movies and 16-mm sound and silent projectors was growing rapidly before the war. With improved equipment that will be available after the war a considerable expansion is anticipated.

Where Time Doesn't March On . . .

. . . unless you step in* now *to help men in German prison camps fight that deadly "barbed wire" boredom

THE CLOCK has a hundred hours on its dial and each hour has 600 minutes when you're penned behind barbed wire.

Nothing to see but that wire, the barrack's wall, and a sentry's back. Nothing to hear but the tramp of his feet, the beefs of your comrades.

So you go slowly, grimly, and sometimes not-so-quietly, progressively towards the "barbed wire disease" unless...

Unless you're lucky enough to have the folks back home get behind the War Prisoners' Aid (one of the 22 participating agencies of the National War Fund) and provide the money to provide the things to feed the hunger of your heart and soul and mind.

Books and baseballs and tennis rackets. Textbooks and technical equipment so you can continue studies the war interrupted. Grease paint and playscripts for your own camp shows. Games of every sort. Anything and everything it's humanly possible to provide to start Time marching on again.

This is just one of the many vital jobs your contribution helps to take care of —when you support the National War Fund by giving to your New York War Fund. Your dollars go to work on six continents and in ninety-one countries—*including your own,* because this united campaign covers the big home-front needs too.

And don't just give a "token" contribution. The job is too big for that. Give—*really* give! Remember that no matter how much any of us gives in money it's still little compared to what the people you'll help have been giving in "blood, sweat, and tears."

GIVE GENEROUSLY TO YOUR

New York War Fund

REPRESENTING THE National War Fund
AND 9 LOCAL WAR SERVICE AGENCIES

JUST A FOOT OF FILM

... Until!

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NATIONAL THEATRE SUPPLY DIVISION

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

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INTERNATIONAL PROJECTOR CORPORATION

INTERNATIONAL PROJECTIONIST

OCTOBER 1944

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Help hasten the day of victory, and help make that victory more secure—buy your War Bonds today.

BUY WAR BONDS

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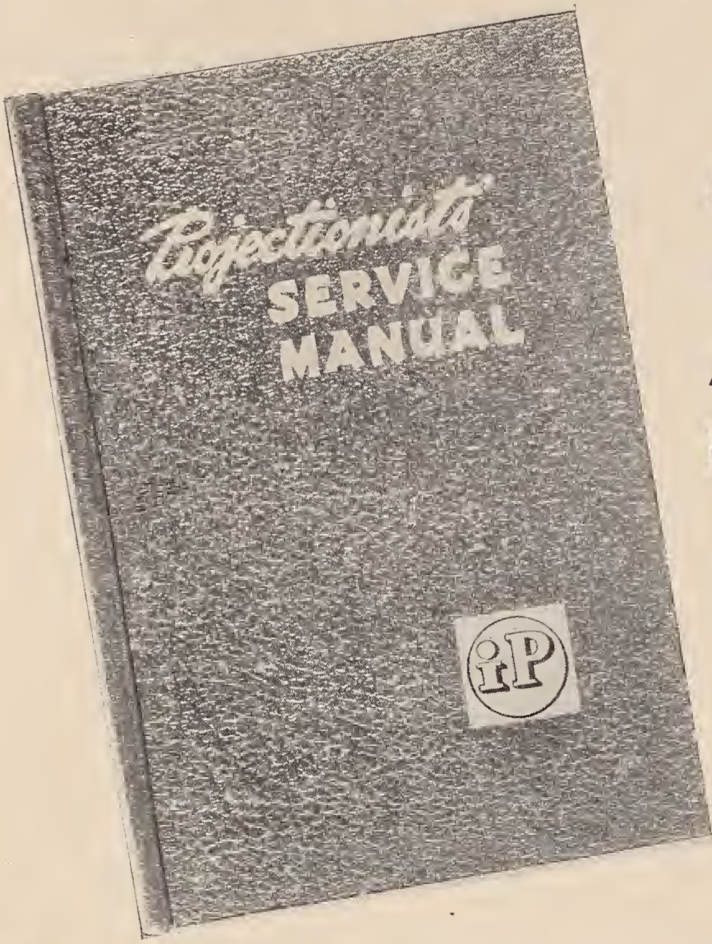

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INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

IT SEEMS probable that the motion picture industry no longer will be able to use unlimited quantities of 35-mm film, due to increasing needs of the military and a lessened production. The War Prodoction Board, in taking cognizance of the situation, states that it is planning to change its allocation procedure whereby motion picture laboratories and service organizations would be permitted to process 35-mm film for motion picture and news reel producers and distributors only upon specific authorization.

The thought comes to mind that our own division of the industry can aid in the conservation of film by exercising maximum care in usage and handling. Most projectionists, of course, do handle film carefully, realizing particularly its value in wartime, but there are some who could improve upon their methods. Technical articles in I.P. during recent years have thoroughly covered this subject.

According to Stanley B. Adams, Director of the Consumer Durable Goods Division, WPB, there are strong indications that there must be a curtailment of unlimited film supplies. In speaking at a meeting of the Motion Picture Producers and Distributors Advisory Committee he pointed to the increasing military needs and added that the fall of Germany is not expected to result in a greatly increased supply of film for professional entertainment pictures and news reels. The net result is, he declared, that his division is contemplating retention, not revocation, of the film order, L-178, on X-Day.

In the fourth quarter of 1944 the supply of 35-mm film is estimated at 555,000,000 linear feet, of which at least 231,000,000 feet are needed for war purposes. This will leave an estimated 324,000,000 feet for the major motion picture and news reel producers, approximately equivalent to the totals shown in L-178. The decline in third quarter film production was due to a seasonal decline in manpower and because some film production equipment, used at capacity for a long time, is being cleaned and repaired and is temporarily out of use.

However, at the same time the Army and Navy require additional 35-mm film at all the battlefronts as a result of the opening of new combat areas and the consequent lengthening of supply lines. And, as the Allied armies advance, increasing quantities of motion picture film are needed by all agencies for rehabilitation, educational propaganda and entertainment purposes in the liberated areas.

This is a case in which 2 and 2 actually equal 4 and it is highly important that every conservation measure be utilized in order not only to keep up the high entertainment quality but also to aid in the over-all war effort. Projectionists, we know, will cooperate 100 per cent while the emergency is critical.

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still critical!

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INTERNATIONAL PROJECTIONIST

VOLUME XIX OCTOBER 1944 NUMBER 10

Thomascolor: Four-Color Process For Motion Pictures

IT HAS been said that necessity is the mother of invention. This is literally true in the case of Thomascolor, an additive system of four-color photography. It has long been agreed that the additive system is ideal for color work of all kinds but until the perfection of the Thomas method the impossibility of continued simultaneous exposure of all color records from one viewpoint made its use impractical for the motion picture industry.

It was the necessity of the motion picture world for a truly natural color system that brought this new method into being. The fact that color so beautiful can be produced with such great simplicity, and that full color, more faithfully reproduced than ever before can be achieved by two optical units which can be held in your hands, indicates the degree of refinement which has taken place in Thomascolor. The original experiments were made in two-color photography, and all the limitations which existed in the other two-color systems were encountered—there was color but not natural color, and it was natural color that inventor Thomas was working to achieve.

Thomas's original equipment was as involved and as complicated as many other color methods which have since been offered to the industry. He was not interested, however, in complicating the motion picture industry—his purpose was to offer the industry a clean, simple, positive instrument that would make natural color photography as easily as black-and-white.

Black and White Films Used

The advantages resulting from the use of additive photography in the motion picture industry are so apparent that many set out to find the answer, but from the mind of Richard Thomas came a solution so completely new that it resulted in the granting of the first generic or basic patent claims for photography in seventeen years. He proved perfected additive photography to be the most direct and simple application of the science of optics and chemistry, for it embodies single viewpoint, simultaneous color separation exposure and simultaneous color image development.

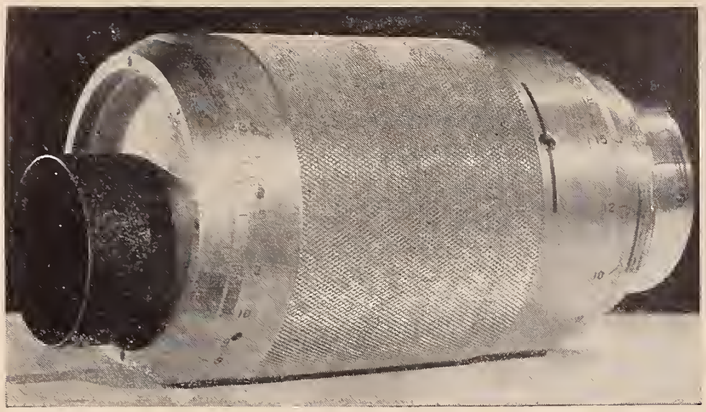
Thomascolor employs only standard single emulsion black-and-white film as well as regular black-and-white technique and developing methods, from the exposure of the original picture through the making of transparent positives. The only variance between black-and-white photography and Thomascolor is that with a single shutter opening his camera photographs four color separation negatives on the same film.

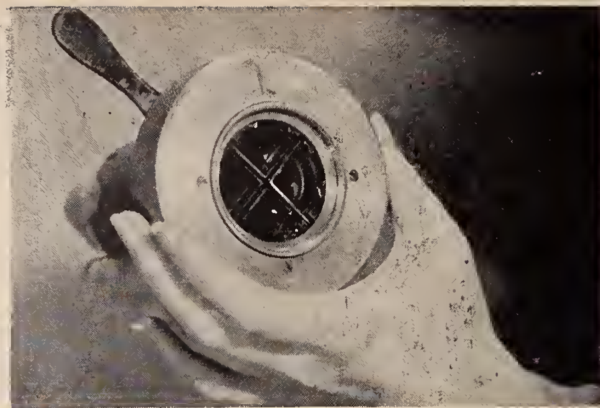
Lest there be any misunderstanding of this basic point, it should be stressed that a Thomascolor motion picture negative consists of a single strip of single emulsion, ordinary panchromatic film on each standard 16-mm or 35-mm frame on which appear four black-and-white images, identical in every respect except that they have been filtered, each through one of the colors used in the process.

Since the Thomascolor camera has but a single aperture and hence a single viewpoint, all parrallax must obviously be eliminated. Perfect registration and identical image sizes are assured to

This article deals with the invention of a camera of the utmost ingenuity by Richard Thomas, scientist and optical engineer of Los Angeles, that makes it possible to photograph four color records simultaneously on a single piece of film from a single viewpoint in perfect register, absolutely balanced as to color, free from all fringing, entirely without parrallax, color beat, ghosting, spherical or color aberration of any kind.

The inventor employs an optical system that embodies refraction, partial and total reflection to make four identical color corrected images simultaneously. A projector of singular ingenuity causes the light passing through the black-and-white positive film to be filtered and thus colored with the four colors used in the system. It is then projected upon the screen where the four images are superimposed in full natural color. No dyes, toning or tinting of any kind are used on either positive or negative. The colors are due entirely to perfect spectral cut-off in making the negative and to projected and superimposed color light in making the picture on the screen.





Left, Thomascolor camera lens mount for converting standard motion picture camera into Thomascolor. Right, a closeup of the Thomascolor projector lens mount for standard film projectors. The inventor points out that this is all that is needed to convert a standard projector to Thomascolor.

within one ten-thousandth of an inch through the Thomascolor optical unit. This optical unit takes the place of the lens of the usual camera, and creates as well the four identical images previously mentioned.

The unit is available in varying focal lengths, and is so designed as to completely eliminate spherical and chromatic aberration and assure the sharpest focus and definition in all four images. This new camera is a radical departure from the one-shot camera used in the motion picture industry in that it employs neither beam-splitters nor photographic mirrors. After the light is admitted through its single aperture, it is carried to the film plane by means of refraction, partial and total reflection. It is interesting to note that at the filters all images are of equal density.

The pictures are reproduced on the motion picture or still screen in natural colors through the medium of a black-and-white positive print, each frame of which contains, as explained above, four identical images. The light from each image passes through a projector unit, a color filter, and then the light from all four images is superimposed on the screen in perfect register. All adjustments possible on ordinary black-and-white or color projectors may be made on Thomascolor.

No Color Fringing

The motion picture screen offers the most exacting test as to the accuracy of the register since an error in image size of 1/1000th of an inch at the film plane is magnified to as much as 5/16th of an inch in a fifty foot throw in the projection room (depending upon the magnification of the lens). Since the camera and projector units are produced allowing tolerances of only 1/10,000th to 1/20,000th of an inch optically, it is needless to say that even under the tremendous magnification of the motion picture projector, Thomascolor films are free of all color fringing.

The projection screen can be approached until within arms length and still there is no fringing of color apparent, nor does the picture lose focus. Even at so close a range objects appear sharp enough to be easily distinguishable. The definition, clarity of color and middle tones reveal new possibilities in color photography. The color brightness range is very high and is carried into the shadows.

The film is developed like any ordinary black-and-white panchromatic film, and as all images are on the same strip, they are developed simultaneously—hence all shrinkage must be equal throughout. Not only the image but the entire picture is kept in exact register; therefore, the four images are automatically in register as to size as well as to superimposition on the screen at all times.

Enlarging and reducing are restored to a normal process by the Thomascolor method. A 16-mm negative can be enlarged to a 35-mm print, and a 35 mm negative can be reduced to a 16-mm print. Enlarging and reducing within the standard sizes is flexible. There is no more loss of detail or definition than with ordinary monochrome (black-and-white) film. The reducing and enlarging process, as with all other operations, can be done with standard equipment now used by the industry.

The use of the super-panchromatic film makes possible all of the shots used in black-and-white work. Where a faster emulsion is necessary the cameraman can turn to it with confidence because the optical unit transmits all of the light to

Richard Thomas, inventor of Thomascolor, checking a new Thomascolor lens on a standard motion picture camera.

S. M. P. E. Papers Program Abstracts

THE S. M. P. E. fall conference held at the Hotel Pennsylvania, New York City, October 16-18, offered a program of technical papers covering many phases of the motion picture art, as well as on television. Following are abstracts of some of the papers read at the sessions:

A MACHINE FOR EDGE NUMBERING 16-MM FILM

Lloyd Thompson
The Calvin Company

An edge numbering machine has been designed and built for edge numbering 16-mm original and work prints. The numbers are printed with white ink so that they can be read easily on the black edges of reversal or color film. It is estimated that by using the machine the matching of originals with work prints can be done in about one-fourth the time formerly required. The service is available to anyone making pictures by the direct 16-mm method.

A PUSH-PULL F. M. CIRCUIT AND ITS APPLICATION TO VIBRATORY SYSTEMS

Alexis Badmaieff
RCA Victor Division
Radio Corporation of America

The purpose of this paper is to describe a new push-pull F. M. circuit. The push-pull action is accomplished by frequency modulating both the oscillator and discriminator components in opposite phase. The modulations are produced by two very small capacitors that are arranged push-pull and having one common plate. This push-pull capacitor can then be coupled to any vibratory system which may be a measuring instrument or a part of any type of transducer to transform mechanical vibrations to electrical variations.

One of the applications of this push-pull F. M. circuit is a cutter calibrator to calibrate recording heads while they are cutting a phonograph record. With this calibrator it is possible to measure the actual frequency response of the head under normal load, distortion, and input-output characteristics. It is also possible to use this calibrator as an absolute monitor while the head is recording.

COMPARISON OF VARIABLE AREA SOUND RECORDING FILMS

Dorothy O'Dea
RCA Victor Division
Radio Corporation of America

This paper describes the test results obtained by comparing the new Eastman 1372 film with those in current use. Our tests indicate that this film has characteristics superior to the Eastman films now in use for variable area sound recording, particularly with respect to density speed, processing tolerances, and requirements for direct positive.

F. M. CALIBRATOR FOR DISC RECORDING HEADS

H. E. Roys
RCA Victor Division
Radio Corporation of America

Previous methods of calibrating disc recording heads are reviewed and a new method which utilizes a push-pull F. M. system is considered. The new method permits calibration during actual cutting of the disc and so has a distinct advantage over the older methods. Results are obtained with a recording head and lacquer discs are discussed.

COAXIAL CABLE AND OTHER FACILITIES FOR TELEVISION NETWORKS

H. S. Osborne
American Tel. & Tel. Company

The telephone companies of the country provide many services which contribute to the entertainment industry. The part they may play in the introduction of television as a new means for the nation-wide distribution of information, news and entertainment is related to the Bell System plans for extending coaxial cable networks. The general features of the coaxial cable system as designed for both telephone and television use are reviewed. The past and possible future use of coaxial cable in television networks are discussed. The possible future development of new types of systems, including repeatered radio is also considered.

TECHNICAL DEVELOPMENTS AT THE NATIONAL FILM BOARD OF CANADA

Raymond Spottiswoode
National Film Board, Ottawa, Canada

The National Film Board has followed quite different lines of development during the war years from those of comparable U. S. film-making organizations, which have been fully described at meetings of the SMPE. It has had the advantage of combining under one authority the film-making and distributing powers which in the U. S. have been scattered amongst a large number of agencies. On the other hand, small size and the need for strict economy have forced it to get along with a minimum of equipment and technical facilities; and U. S. engineers, as producers of the best movie equipment in the world,

(*Continued on page 25*)

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the film plane. There are no intervening neutral density filters to hinder the full action of the light on the emulsion.

The shutter speeds at which Thomascolor may be shot are dependent upon the type of panchromatic film used. Under favorable conditions speeds up to 1/1000th of a second have been employed in both motion pictures and still photography.

Brightness Range Enhanced

In projection, the light from an ordinary lamphouse is ample. Since there is only white light coming through the single emulsion transparent print, and the light transmission area is as great as with black-and-white film, with no dyes to penetrate. the light transmission to the screen is nearly total. An unusual brightness range is the inevitable result.

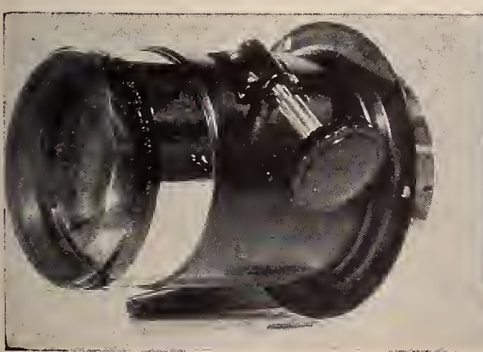
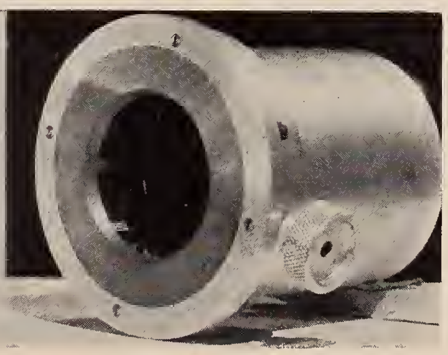
Another outstanding advantage of Thomascolor is the fact that the sound track can be handled in the usual manner. This is a natural result of the use of ordinary film which can be developed and printed by the prevalent black-and-white methods.

Special effects and trick work are practical due to the fact that the process is basically black-and-white and the color results from light rather than from dyes.

The Thomascolor projector mount, which is about the size of the average projector lens, slips right into place where the projector lens is taken off. There are no moving parts in this assembly. The projector mount has all the flexibility of the standard projector lens. Adjustment can be made for focus, length of throw, and superimposition of the four color images. Projection is made on standard, portable or giant screens.

Since four color separation images take the place of a single 35-mm black-and-white frame, the same area of light is actually transmitted to the screen as when black-and-white pictures are shown. Superimposition of one color upon another eliminates any disposition to graininess and intensifies the brightness range of the colors.

Although the process was invented to solve the problem of color for the motion picture industry, it has been found to be basic and has an application to every occupation where photography and visualization is used. The Thomascolor system can be used for still photography as well as for the graphic arts and television.

Left, a regular projection lens for standard projector. Right, Thomascolor projector lens mount that converts a standard projector to Thomascolor.

Projectionists' Course on Basic Radio and Television

By *M. BERINSKY, E.E.*
MEMBER OF INSTITUTE OF RADIO ENGINEERS

IV.—PARALLEL CIRCUITS

LAST month we dealt with series circuits as they are used in radio work. Such circuits are quite common in certain kinds of radio and electrical work. More common, however, is the parallel circuit. Practically all electrical loads are connected in parallel. This is necessary for proper operation. If electrical circuits were connected in series very large values of voltage would be required to operate simple loads. For example, if we wished to light five 110-volt lamps which were connected in series. we would need 550 volts. If it were desired to light three 110-volt lamps, 330 volts would be required. Such large values would be dangerous for home use.

Another serious disadvantage of series operation of electrical loads is the fact that all loads must be connected in the circuit at all times. Also, such loads must be in working condition. Should one of the loads burn out the circuit would be broken and the entire group of remaining devices would refuse to function.

From the examples given above one can readily see why series operation of electrical loads is not very popular. One exception is subway lighting. The trains in the New York subways operate on 550 volts d.c. Because this high voltage is available, it is most convenient to connect five 110-volt lamps in series. In some cities street lights also operate on 550 volts. Due to the importance of parallel circuits in every-day electrical practice, this article will be devoted chiefly to a practical and mathematical analysis of such loads.

Difference Between Circuits

Parallel circuits differ from series circuits in many ways. In Figure 1 we see two resistors connected in parallel. You will note in this illustration that the ends of resistor R_1 are connected directly to the ends of R_2. In a series circuit only one end of R_1 is connected to one end of R_2 and the other two ends are left free.

In a series circuit the current through each resistor is the same. In a parallel circuit the line current divides through each resistor, the amount being inversely proportional to the size of the resistors. In a series circuit the line current will become zero if one of the circuit elements burns out. In a parallel connection one or more of the circuit elements may be disconnected and the circuit will still continue to function properly. It is for this reason that house lights are connected in parallel. If our house lights were connected in series we would have to keep them all on even if we required the illumination from only one lamp.

The calculation of parallel circuits differs greatly from that of series circuits although Ohm's Law is used in both cases. Figure 1 shows that when two resistors are connected in parallel the current has two paths through which to travel. If ten resistors were connected in parallel, the total current would split up into ten separate and individual currents. Remember that in a series circuit only one path is available for the current regardless of the number of resistors so connected.

A simple analogy to a parallel circuit will now be given. Suppose that a bucket of water had one orifice through which a certain amount of water current was flowing. If we were to make another orifice in this bucket, more water would flow in a given time than was the case when the bucket had only one orifice. The reason for this is that more paths have been provided through which the water could flow. The same is true with electrical circuits.

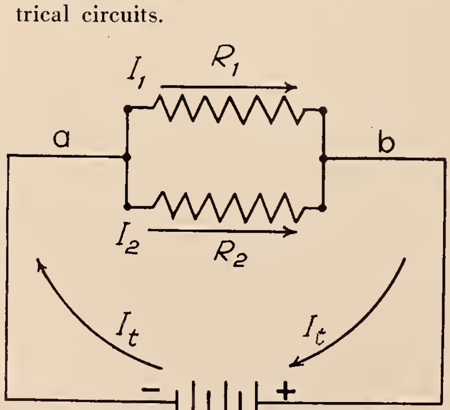


FIGURE 1. *Two resistors connected in parallel showing the division of currents in circuits.*

For example, if a 10-ohm resistor were connected across a 50-volt source, a current of 5 amperes would flow. If two 10-ohm resistors were connected in parallel across a 50-volt source, 5 amperes would flow through each resistor making a total current of 10 amperes. We see, therefore, that the current in a parallel circuit will increase as the number of paths in the parallel branch are increased.

Since more current flows when more resistors are connected in parallel it becomes obvious that the resistance of the parallel branch will decrease as more resistors are added to it. This is exactly the opposite from the series circuit, where the resistance increases when more resistors are added to the series branch.

Rules for Parallel Circuits

Following are some rules governing parallel circuits:

1. *When two resistors are connected in parallel the total resistance will be smaller than the smallest resistor.*
2. *In a parallel circuit there are as many separate currents as there are resistors in the circuit, since the total current divides into as many currents as there are paths.*
3. *The amount of current flowing towards a parallel branch is the same as the current flowing away from the same branch.*
4. *The voltage drop across one resistor in a parallel branch is the same as the voltage drop across any other resistor in that same branch.*
5. *The algebraic sum of the currents flowing through a parallel branch is equal to the total circuit current.*
6. *Parallel circuits are especially useful when the available voltage is small.*
7. *Batteries are connected in parallel when large currents are desirable. For example, in direct current sub-stations.*

Suppose that you had a battery which was capable of supplying a maximum current of 2 amperes, and you had a load which consumed 10 amperes. Such a load would not operate properly when connected across the battery. At least five such batteries should be connected

in parallel in order to properly operate the load in question. It is best to be on the safe side, however, by having six or seven such batteries connected in parallel so as not to overload any of the batteries should one or more of them cease to function.

One very important precaution must be observed when connecting batteries in parallel. Never connect batteries in parallel if their terminal voltages are not alike. For example, a 2-volt battery should not be connected in parallel with a 6-volt battery. If this were done there would be a difference of potential between the 2-volt battery and the 6-volt battery, and current would flow out of the 6-volt battery into the 2-volt battery. This flow of current would continue even if the external load were disconnected from the batteries. Such a flow of current would tend to wear out the batteries in a short space of time.

Connecting two dissimilar batteries in parallel is like putting a partial short circuit on them. The currents in a parallel circuit are inversely proportional to the resistances. This means that if a 10-ohm resistor were connected in parallel with a 20-ohm resistor, the 10-ohm resistor would take more current than the 20-ohm resistor. Use of this fact is made in many practical radio and electrical circuits.

Parallel Circuit Calculations

Ohm's Law can be applied to parallel circuits in much the same way that it is used to solve series circuits. The application of Ohm's Law to parallel circuits is somewhat more difficult than is the case with series circuits. This difficulty arises from the fact that the circuits are more complex in their nature. Instead of dealing with one current as is the case with series circuits, we must now deal with two or more currents depending upon the number of parallel paths in a branch.

The method for finding the total resistance in a parallel circuit is much more difficult than the simple method used with series circuits. You will remember that in order to find the total resistance in a series circuit you simply had to add the values of all the resistors. For example, if we had a 5-ohm resistor connected in series with a 10- and a 25-ohm resistor, we could find the total resistance by adding these values. The answer would equal 40 ohms. Three resistors connected in parallel can not be solved for total resistance by any such simple means.

Several examples of parallel circuit calculations will now be given. First, let us bear in mind a very important rule: *whenever a number of resistors are connected in parallel and they all have the same value or resistance, the total resistance is equal to the value of one resistor*

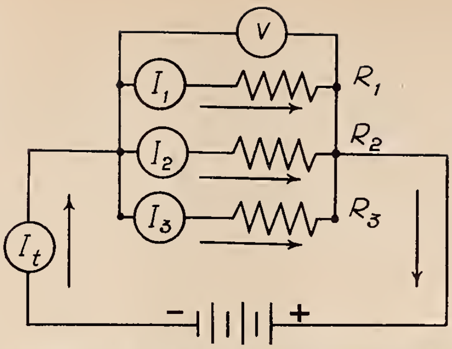


FIGURE 2. ***Three resistors connected in parallel showing the proper method for measuring the currents in each resistor and the voltage across the parallel branch.***

divided by the number of resistors in the branch.

The formula for the total resistance of a parallel branch of like resistances is $R_t = \dfrac{R}{N}$, where R_t is the total resistance, R is the value of any one resistor (R will be the same for any resistor) and N is the number of resistors in the circuit.

Let us try some problems dealing with similar resistances in parallel. Suppose that R_1 and R_2 in Figure 1 both have a value of 16 ohms. The total resistance between points *a* and *b* will be 8 ohms. Here is how we arrived at this figure. The resistance of either resistor is 16 ohms. To find the total resistance between points *a* and *b*, this value of 16 should be divided by the number of resistors in the circuit. Since there are two resistors in the circuit of Figure 1, the number 16 has to be divided by 2. The quotient of 16 divided by 2 is equal to 8.

We now will try another example of this type. Suppose that three 100-ohms resistors are connected in parallel, and it is desired to find the total resistance of the circuit. Using the formula just given we have $R_t = \dfrac{R}{N} = \dfrac{100}{3} = 33.3$ ohms.

The examples just cited are of a very simple type and should not give us very much trouble. However, problems as simple as these do not occur very often in practical work. The type of problems which do occur frequently can not be solved by any such simple methods. The problems to which I have reference are those involving resistors whose values are not equal. Some special formulas for problems of this kind will follow. First, we will consider the solution of a parallel branch consisting of only two resistors. Such problems occur most frequently in radio and electrical work. *The total resistance of two resistors connected in parallel is equal to the product of these resistors divided by their sum.*

The formula for the total resistance of two resistors in parallel is $R_t = \dfrac{R_1 \times R_2}{R_1 + R_2}$.

In this formula R_t is the total resistance and R_1 and R_2 refer to the two resistors in Figure 1. Now for a practical example; suppose that R_1 and R_2 are equal to 16 ohms. This is the same example that was given previously, and can be solved by the simple method used at that time. However, for the sake of illustration, let us use the same problem. R_1 times R_2 equals 16 times 16, or 256. This figure should now be divided by R_1 plus R_2, or 32. Dividing 256 by 32 yields a value of 8 ohms. This is the same value which was obtained when we solved this problem by the simpler method explained earlier in this article.

Applying Formula

When two resistors having different values of resistance are connected in parallel and a solution is desired, we are limited to the formula just given. We will try another example, making use of this formula. Suppose that R_1 is equal to 5 ohms and R_2 is equal to 10 ohms. Find the total resistance. Using the formula we have $R_t = \dfrac{5 \times 10}{5 + 10} = \dfrac{50}{15} = 3.33$ ohms.

In order to master the solution of parallel circuits constant practice is required, especially if your mathematical background is limited to arithmetic. We suggest that, in addition to working the problems which are appended to this article, the reader should make up his own problems, assigning any value to R_1 and R_2, and making use of the two formulas just given. These formulas should prove sufficient for most problems.

In an earlier paragraph we mentioned the fact that Ohm's Law is used for both

SEPTEMBER QUESTIONS AND CORRECT ANSWERS

Q. **A toaster draws 5 amperes when connected to 110-volt mains. Find its resistance. How much power does it consume?**

A. ***R*** **equals 22 ohms.** ***P*** **equals 550 watts.**

Q. **Two No. 201-A tubes are connected in series with a resistor to a 15-volt battery. How much resistance is required in order that the tubes light properly? How much power should the resistor be capable of dissipating?**

A. ***R*** **equals 20 ohms.** ***P*** **equals 1.25 watts.**

Q. **A 10-ohm and a 15-ohm resistor are connected in series to a 100-volt source. Find: (a) the total resistance of the circuit; (b) the total current; (c) the voltage drop across the 10-ohm resistor, and (d) the voltage drop across the 15-ohm resistor.**

A. **(a)** R_t **equals 25 ohms; (b)** I **equals 4 amperes; (c)** E **equals 40 volts, and (d)** E **equals 60 volts.**

series and parallel circuits. Some applications will be shown in the following example. Suppose that the battery in Figure 1 has 50 volts of e.m.f., and R_1 and R_2 equals 5- and 10-ohms respectively. Find the value of the currents of I_1 and I_2 which flow through R_1 and R_2. The voltage across points a and b is the voltage across R_1 and R_2, and is also the voltage across the battery. $I_1 = \frac{E}{R_1} = \frac{50}{5} = 10$ amperes. $I_2 = \frac{50}{10} = 5$ amperes.

In a parallel circuit the total current is equal to the sum of the individual currents. The total current in the example just given is 15 amperes. The formula for total current in a parallel circuit is $I_t = I_1 + I_2 + I_3 + \ldots I_n$, where I_t is the total current and I_1, I_2, I_3, etc., are the currents through the resistors R_1, R_2, R_3, etc.

While the formulas that have already been given are sufficient for most practical solutions, a special case sometimes arises which requires a more difficult method of solution. On some occasions it is desired to solve a circuit that contains three or more resistances in parallel. The formula for three or more resistors in parallel is as follows: $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$.

Let us now refer to Figure 2. Suppose that the three resistors in this illustration have the following values: $R_1 = 5$ ohms: $R_2 = 10$ ohms, and $R_3 = 20$ ohms. We will now illustrate the proper use of the above formula. Substituting numbers for letters we get $\frac{1}{R_t} = \frac{1}{5} + \frac{1}{10} + \frac{1}{20}$.

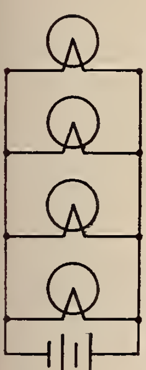
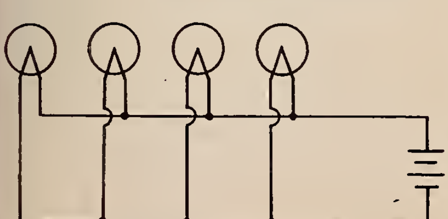


FIGURE 3

Two methods, (a) left and (b) below, for drawing a parallel circuit consisting of four vacuum tube filaments. This circuit is used in battery receivers and in a.c. radios but is not used in a.c.-d.c. receivers.



The fractions should now be changed into decimals—one-fifth is 1 divided by 5, equalling 0.2; one-tenth is 1 divided by 10 and equals 0.1; and one-twentieth is 1 divided by 20, equalling 0.05. Substituting these decimals in the equation we get $\frac{1}{R_t} = 0.2 + 0.1 + 0.05$. Adding the right-hand side of the equation gives $\frac{1}{R_t} = 0.35$. We are interested in the value of R_t, however, and not in the value of $\frac{1}{R_t}$.

To get R_t from this equation it is necessary to invert both sides.

To invert $1/R_t$ we simply write it as $R_t/1$, which is equal to just R_t because any number divided by 1 equals that same number. To invert 0.35 we write it as 1/0.35. The equation now reads $R_t = 1/0.35$. Solving this equation gives $R_t = 2.855$ ohms. Note that the answer is smaller than the smallest resistance in the circuit. In practice it is not necessary to carry out an answer to three decimal places because radios are not designed to such close tolerances. A practical answer would be 2.9 ohms.

Calculating Currents

The currents in the parallel branch can be calculated by Ohm's Law. Assume that the battery contains 100 volts. I_1 equals 100/5 equals 20 amperes; I_2 equals 100/10 equals 10 amperes, and I_3 equals 100/20 equals 5 amperes. (Note that the smallest resistor takes the greatest current.) The total current equals 20 plus 10 plus 5 which equals 35 amperes. The total current could also have been found by dividing the total voltage by the total resistance, thus, 100/2.855 equals 35 amperes.

The power taken by each resistor can best be found by using the formula $P = E \times I$. $P_1 = 100 \times 20 = 2{,}000$ watts. $P_2 = 100 \times 10 = 1{,}000$ watts. $P_3 = 100 \times 5 = 500$ watts. The total power taken by the circuit is given by the formula as follows: $P_t = P_1 + P_2 + P_3$. In the example above the total power is 2,000 + 1,000 + 500, or 3,500 watts.

In Figure 2 we see three resistors connected in parallel. Proper connection of ammeters are also shown. The circuit must be broken in order to insert these meters. Notice especially the points where these meters are inserted. Only one voltmeter is needed to measure the voltage across the parallel branch because the voltage across any one resistor is the same as that of the branch.

We see in Figure 3 four vacuum tube filaments connected in parallel. Parts a and b of this illustration are exactly alike although they look like two different circuits. The reader should practice tracing circuits so as to be able to recognize them regardless of how they are drawn.

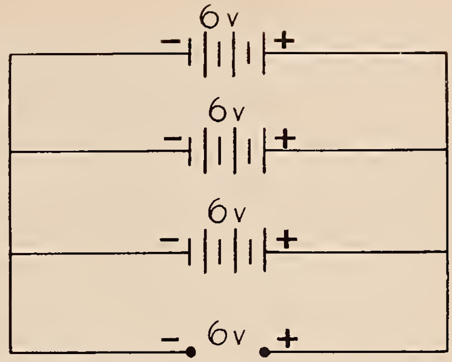
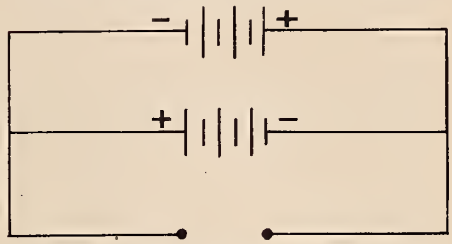


FIGURE 4. *The correct, (a) above, and the incorrect, (b) below, method for connecting batteries in parallel.*



The correct and incorrect methods for connecting batteries in parallel are shown in Figure 4. Part a of this drawing shows all of the negative electrodes of the batteries connected together, and all of the positive electrodes are similarly connected together. This is correct. In part b of Figure 4 the positive electrode of one battery is connected to the negative electrode of the other battery. Under such conditions the batteries would wear out even under no-load conditions. Such a connection is obviously wrong.

OCTOBER QUESTIONS

1. Four 64-ohm resistors are connected in parallel. Find the total resistance.

2. Three resistors of 10 ohms, 20 ohms, and 50 ohms each are connected in parallel across a 100-volt source. Find the total resistance of the circuit.

(a) Find the current through each resistance.

(b) Find the total current of the circuit.

(c) Find the power taken by each resistor.

(d) Find the total power of the circuit.

The correct answers to these questions will appear in the next issue.

W. E. DECLARES DIVIDEND

Directors of the Western Electric Company have declared a dividend of 50 cents per share on its common stock. The dividend was payable Sept. 29 to stock of record at the close of business on Sept. 22.

The Duplex Loudspeaker†

By *JAMES B. LANSING*
ALTEC LANSING CORPORATION

The Duplex Loudspeaker is a combined two-way loudspeaker mounted in an integral unit so that the high-frequency energy is radiated from a small multicellular horn mounted on the face of the low-frequency diaphragm.

Separate permanent magnets of improved magnetic material are now used for the fields of each voice coil. The crossover has been selected at 1200 cycles so that the high-frequency horn can be placed in the center of the low-frequency diaphragm.

A signal input up to 25w can safely be applied to the speaker. The intermodulation products are very low as a result of the two-way principle. The configuration of the high-frequency horn produces an angle of radiation which is 60 degrees in the horizontal plane and 40 degrees in the vertical plane. Due to the type of construction a high degree of uniformity between units can be maintained in manufacture.

The unit is capable of efficient radiation beyond 15,000 cycles.

THE practical application of the Two-Way Multicellular Loudspeaker System for theatre use began in 1935. Since that time there has been a gradual improvement in its quality and general performance. The wide acceptance of the high performance standard set by this two-way loudspeaker system indicated that the benefits to be realized by applying the same principles to loudspeakers for recording, monitoring, and broadcast radio work would be considerable.

Since the large size of the theatre system (Figure 1) precluded its use in monitoring booths, the immediate requirement was that a substitute be found for the large folded horn used for the low-frequency band. Reduction in the size of the low-frequency horn called for a corresponding decrease in the size of the high-frequency horn in order to make the whole equipment compact.

The first development to meet these requirements for a smaller system made use of a 500-cycle crossover network and a high-frequency horn designed to give proper acoustic loading at crossover.

The folded-type horn, much reduced in size, using a 15-in. speaker was retained for the low-frequency end. While this design had adequate freqency range for most small rooms and is being used in large numbers by our armed services, it was still too bulky for the "cubbyhole" type monitoring room. The effect of separate sources for the different frequency bands was annoying when used in close quarters.

In 1937, the first two-way loudspeakers using the multicellular high-frequency horn in conjunction with a resonated low-frequency baffle were made available under the name of Iconic Loudspeakers (Figure 2). A crossover frequency of 800 cycles was used with a corresponding decrease in the size of the high-frequency horn, compared to that used with the 500-cycle crossover systems. These loudspeakers were far more compact than those using horns of various configurations for the low-frequency band. Operating efficiency, while not as high as in the larger systems, was still high when consideration was given to the decrease in size.

During 1941, intensive work was undertaken to find a method of producing a loudspeaker of still more compact form, retaining the same performance characteristics of the larger systems, and at the same time totally eliminating the tendency to radiate from split sources when used in close quarters.

The intermodulation distortion effects produced by a single diaphragm, when operating at a multiplicity of frequencies simultaneously, precluded the use of a single diaphragm for all frequencies.[1]

A metal diaphragm designed to operate as a piston up to frequencies above the limits of audibility, was chosen for the high-frequency reproducing system. Aluminum alloy was used because of its high mass stiffness and high velocity of transmission. The resulting lightweight diaphragm is stiff enough to prevent its breaking up as a piston and thus introducing the intermodulation effects so common to the familiar paper and other fibrous types of diaphragms.

Careful consideration was given to the type of high-frequency radiation system to be used. If the diaphragm was to radiate directly and was made small enough to avoid sharp beam effects at high frequencies, it became too small to handle enough power, near the crossover

†*J. Soc. Mot. Pic. Eng., Sept. 1944.*

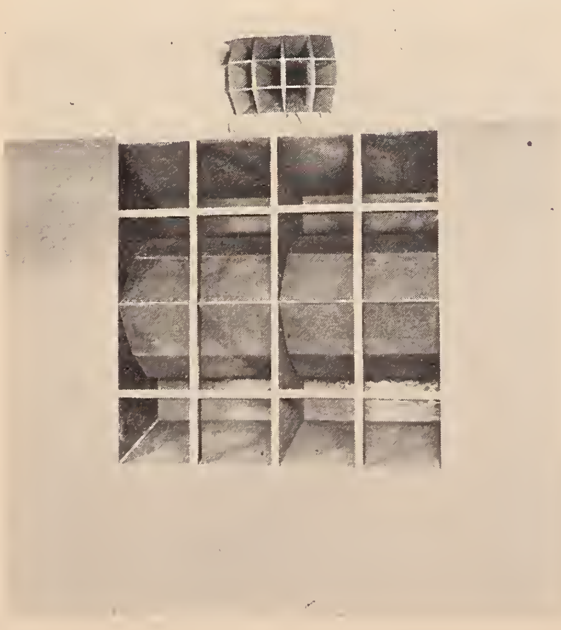


FIGURE 1. *(left)* *Two-Way Multicellular Loudspeaker system for theatre use.*

FIGURE 2. *(right)* *Iconic Loudspeaker.*

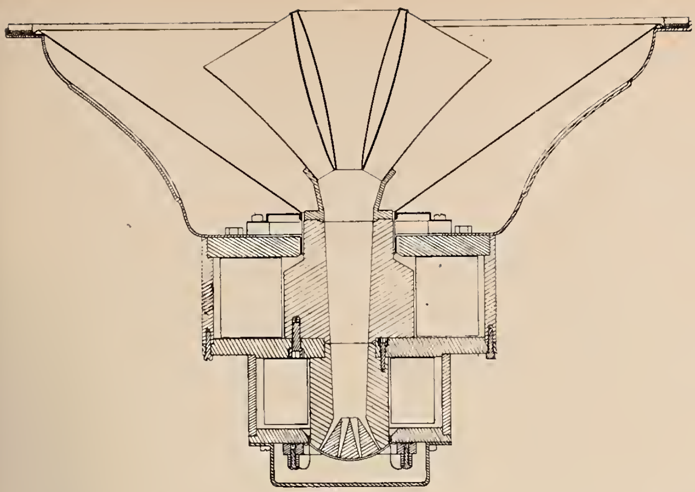


FIGURE 3.

Cross-sectional view of Duplex Loudspeaker.

region, for practical purposes. Accordingly, the multicellular type high-frequency horn was chosen as the radiating medium.

The final design for the high-frequency horn was a 2 x 3 configuration of 6 cells, with a 900-cycle cutoff, which could be enclosed by the low-frequency cone. The maximum angle of horizontal distribution was held to approximately 60 degrees in order to prevent interference from the mounting baffle at the high frequencies.

Figure 3 is a cross-sectional view of the completed Duplex Loudspeaker showing the arrangement of the functional parts in their proper relation. The high-frequency horn is shown mounted on the end of the low-frequency unit pole piece, which is bored out to permit the passage of sound from the high-frequency unit. A fine mesh bronze screen at the junction of the pole pieces prevents the entrance of foreign particles into the high-frequency sound chamber. Positive alignment of the bores of the 2 pole pieces and of the horn mounting flange avoids discontinuities which would cause destructive interference along the high-frequency sound transmission path.

The high-frequency horn is covered with a sound deadening material, but is not finished with a smooth surface which would set up a regular reflection pattern for sounds being generated by the surrounding low-frequency cone. The dome-shaped high-frequency diaphragm is shown in place over its transducer, which effectively prevents destructive interference from being set up in the sound chamber. The high-frequency voice coil is wound with aluminum wire to hold the mass of the moving system to a minimum. The low-frequency system consists of a 15-in. paper cone with its actuating motor system and surrounding mechanical structure.

A frequency dividing network of the constant impedance type is used with a crossover frequency of 1200 cycles (Figure 4). The selection of the 1200-cycle crossover point permits the 900-cycle cutoff horn to adequately load the high-frequency unit down to a frequency where it transmits little power. This eliminates any tendency to produce the distortion effects which would be caused if the acoustic loading were to cut off sharply at crossover, and effectively prevents any damage to the high-frequency unit because of unloading when the maximum rating power is applied in the crossover region.

Figure 5 shows the Duplex Loudspeaker and its dividing network. These networks use iron cored reactors capable

(*Continued on page* 30)

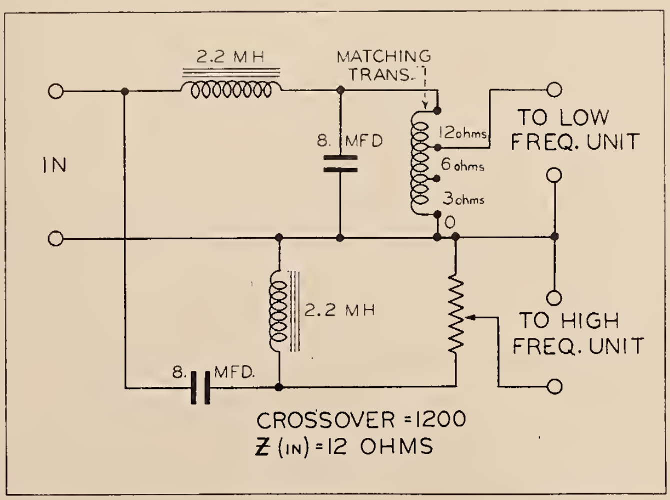


FIGURE 4.

Frequency dividing network of the constant impedance type used with crossover frequency of 1200 cycles.

25-30 Club Notes

THERE was a fine turn-out at the opening meeting of the new winter season. The members were glad to get together again and many a story was swapped over the refreshment table.

One of our out-of-town members, Owney Kavanagh, secretary of Local No. 233, Buffalo, N. Y., was in town the night of the meeting but was unable to put in an appearance because of an important business engagement which kept him busy until the wee hours.

During the summer vacation three of the members became grandfathers—Teddy Salomon, Dave Narcey, and yours truly. Yes, sir, Father Time certainly is catching up with us.

The next meeting, to be held at midnight Friday, October 27, will be open to all projectionists. James Frank, Jr., author of the very fine articles on television appearing in I. P., is scheduled to give a talk on the subject. We look forward to a most interesting meeting.

Five new honorary members were elected—Dr. Alfred N. Goldsmith, renowned consulting engineer specializing in the electronic arts, and past president of both the Institute of Radio Engineers and the Society of Motion Picture Engineers; Harold Williams and Gus Durkin, members of Local No. 1, New York City, who were very active in organizing the local many years ago; Robert Goldblatt, who obtained the charter for Local No. 306 and was elected its first president; and Father Robert A. Boelcke, chief of the Science Department of St. Mary's College of Pennsylvania, and who, incidentally, is a first-class projectionist.

Jack Lieberman, member of Worcester, Mass., Local No. 96, was obligated and promised to attend all future meetings.

In tribute to the memory of the late Andrew J. Seeley, the membership arose and stood in silent prayer for one minute. He was eulogized by P. A. McGuire and yours truly. The Club lost a very fine member—a man of principle and high ideals.

BALDWIN NAMED MANAGER OF N.T.S. EXPORT

The appointment of Arthur F. Baldwin as manager of the National Theatre Supply export division of National-Simplex-Bludworth was recently announced by W. E. Green, president of NTS. The appointment is in line with the company's recent announcement that a complete line of theatre equipment will be made available through its foreign distributors to exhibitors in many countries outside the United States. Mr. Baldwin has been associated with National's sales department for eleven years. M. V. Higgins has been appointed assistant export manager.

Equipment that will be available for export shipment will include Simplex projectors, Simplex sound systems, Simplex high tensity lamps, Peerless Magnarc lamps, Hertner Transverters, Walker Screens, chairs, carpets, Bausch & Lomb lenses and a complete line of accessories and supplies.

Presenting: William P. Covert

WILLIAM P. COVERT, business manager of Local 173, Toronto, Canada, and second vice president of I.A.T.S.E., has the proud honor of having been a motion picture projectionist for 38 years and of having held office constantly in Local 173—which he aided to organize—since its inauguration. He was a strong-minded believer in the labor movement when he entered the industry, and remains so today. He said the other day that the fight years ago was a difficult one, and that the same fact is true now, and realizes that a continuing fight is essential if labor is to achieve its rewards.

Covert started as a projectionist in 1906 with the late John Griffen, when the moving picture mechanism and lamp were fastened to a table board and stood on four spindly steel legs. The film was run into a bag or box as no magazine was available, and a show generally consisted of four short subjects on a thousand feet of film together with one illustrated song. The admission price was 5 cents.

It was in the spring of 1909 that a few poorly paid (the wage was $6 a week for a ten-hour day) projectionists decided to form a union. After a number of organization meetings 22 of them were obligated and chartered by the I.A.T.S.E. on Nov. 17, 1909. From that point started the struggle for recognition which only was reached through a general strike in 1912. At the same time the local won its fight for government inspection and public safety control and succeeded in having the late Bob Newman, a member of I.A.T.S.E., appointed as chief inspector. At that time the majority of employers fought the union at every step of the way.

The first union contract was signed in 1917. Overtime rates were established at time and one-half, and, as Covert says "we have grown from that 22 to a membership of 230 and we enjoy the finest possible friendship and cooperation with our employers."

All contracts and conditions are established through friendly arbitration. Members receive sick benefits established by the local, and each member receives blanket insurance of $2,000. Their compensation is on a par with that of other locals.

From the old days of the hand-cranked machine, Covert has seen the successful introduction of motor-driven equipment and the invention and perfection of sound. He has seen the cramped quarters of the early century changed to well ventilated projection rooms and many other improvements too numerous to mention here.

He was elected delegate to the I.A. Convention in 1917, which was held in Cleveland, where he fought the international administration for constitutional representation by a Canadian on the International executive board. He was elected in 1918 to the board as its seventh vice president, and laws were adopted calling for permanent Canadian representation. He has been a vice president ever since, now being one of the senior elected officials of I.A.

"PICK-UPS" REVIVED UNDER NEW TITLE BY W. E.

Western Electric has revived "Pick-Ups," its publication well known to the radio industry before the war, which is now called "The Western Electric Oscillator." The current issue, dated September, carries a number of articles of significance to the radio industry. As the introductory editorial explains the publication's name derives from the vacuum tube oscillator—developed by Bell System scientists, and heart of broadcasting's technology.

TWO NEW VICE PRESIDENTS NAMED BY BELL & HOWELL CO.

L. A. McNabb and B. E. Stechbart have been named vice presidents by the Bell & Howell Company. Mr. McNabb is in charge of electronic design and production and Mr. Stechbart is in charge of mechanical engineering and research.

Mr. McNabb was an honor man in electrical engineering at the University of Detroit, and after holding various posts with Bell & Howell earned his top-notch position as director of electronics. He organizes, supervises and directs research, engineering and production of electronic mechanical devices at the Lincolnwood Laboratories.

Mr. Stechbart has been a brilliant chief engineer, with engineering the dynamic interest of his whole life. To his formal education he has added with keen determination and energy personal research, self teaching and night school courses in his field.

ALTEC MANAGERS WILL MEET IN HOLLYWOOD OCT. 16-20

District and branch managers of the Altec Service Corporation will hold their 1944 business conference Oct. 16-20 at the Hollywood Roosevelt Hotel, Hollywood, Cal., according to G. L. Carrington, president of the company. He states that the conference will be the most important in Altec's history and will be attended by the entire district manager personnel from all over the country. and that in addition branch managers and field supervisors will be in attendance to review the various ways and means Altec has devised in keeping theatre sound equipments functioning at peak performance during the war period. They will be given the opportunity to examine, hear and discuss post-war equipment and new and improved Altec technique in servicing and furnishing of repair and replacement parts.

Those at the conference will visit the various manufacturing and assembly plants of Altec Lansing Corporation to view the manufacture of theatre loudspeaker systems, theatre amplifier systems and components, power supply units, transformers, networks and associated electronic apparatus.

Executives who will attend the conference from Altec's New York office will be Messrs. G. L. Carrington, president; H. M. Bessey, vice president; E. Z. Walters, comptroller; Stanley W. Hand, advertising and publicity manager, and H. S. Morris, purchasing agent and merchandising manager. District managers, branch managers and district supervisors as follows: Atlanta, H. B. Moog, district manager; Boston, L. J. Hacking, district manager; Chicago, R. Hilton, district manager; R. C. Gray, district supervisor, and O. E. Maxwell, Minneapolis; Cincinnati, Warren Conner, district manager, and M. G. Thomas, branch manager; Dallas, C. J. Zern, district manager, and G. E. Wiltse, district supervisor; Detroit, F. C. Dickely, district manager; Los Angeles, S. M. Pariseau, district manager, and R. A. Quinn, branch manager; New York, Bert Sanford, Jr., district manager, A. J. Rademacher, branch manager Western New York, and L. J. Patton, branch manager Eastern New York; Philadelphia, D. A. Peterson, district manager; Seattle, W. C. Gregory, district manager; electronic division at Lexington, Mass., C. S. Perkins, manager.

Altec Lansing Corporation West Coast executive personnel attending the Altec conference will be A. A. Ward, vice president and general manager; J. B. Lansing, vice president and chief engineer of loudspeaker and mechanical division; John K. Hilliard, chief engineer of radar and motion picture division; E. O. Wilschke, plant superintendent of McKinley Avenue plant; A. Fiore, plant superintendent of 15th Street plant; E. B. Lee, assistant secretary and assistant treasurer; J. Maurice Ridge, sales and personnel director; J. A. Cameron, engineer of manufacturing information, and Harry W. Dodge, priorities supervisor and liaison officer, Altec Lansing Corporation.

REMOVE CURBS ON ACCESSORIES

The War Production Board has removed controls over the production and distribution of 35-mm motion picture projection accessories such as film rewinders and splicers. It is pointed out, however, that projection equipment, including sound and amplifying systems, remains under control.

The action was taken through amendment to L-325, covering 35-mm motion picture projection equipment and accessories. The amendment also adds carbon adaptors, reel-end alarms and safety control devices to the list of accessories released from control. There had been some confusion in the industry as to whether these items were accessories or repair parts, it was explained by WPB.

Form WPB-1319 has been substituted for the special application forms WPB-3253 and WPB-3254 for projection equipment.

IN THE SPOTLIGHT

By HARRY SHERMAN

THIS is an indictment of those "thrifty" theatre owners who insist upon one-man per shift operation of their projection rooms.

Edward Riley. member of Local No. 306, worked in such a one-man operated projection room until the early part of this year when a fire broke out in the rewind room and almost cost him his life. Perhaps a description of the rewind room, which was little more than a cubby-hole, will give a clearer picture of what transpired on that fateful day.

This very small rewind room, with no outside ventilation except for a tiny opening in the ceiling leading to the roof of the building, contained a film cabinet set directly on the floor. In back of this cabinet was a motor generator for the W. E. sound system, and on a shelf overhead were two rheostats (50 amps.) for the Suprex lamps; a motor for the open rewinder was placed under the rewind shelf. Consequently, the electrical units not only raised the room temperature to a considerable degree, but they were in close proximity to the film in the cabinet. Access to the projection room—booth better describes this particular one—was by means of a ladder which led to the only door through which one could enter or leave the room.

A sheet of flame that shot out of the rewind room was Riley's first warning that something was wrong. He immediately stopped the projector and dropped the shutters in an effort to prevent the blaze from spreading to other parts of the theatre. In doing so, however, he jeopardized his own safety for it then was too late to escape through the one door. He jumped from the small window in the rear of the projection room and landed in a pile of rubbish three stories below with his clothing aflame. He was picked up and rushed to the hospital.

After the fire a new rewind room was constructed, and a new film cabinet containing an automatic sprinkler was installed and connected to an outside vent. Also, a second door leading from the projection room to the auditorium was added. Edward Riley, however, is still in the hospital minus a leg which had to be amputated as a result of injuries sustained in his fall from the projection room window.

Mr. Theatre Owner repaired the damage to his theatre—but Mr. Projectionist is maimed for life. The irony of it!

This is not an isolated instance—these fires and accidents occur every day in the week but they are not always reported. Many union officials have already taken steps to prevent such "accidents." Have you?

I. A. PRES. WALSH AND OFFICERS OF L. 249, DALLAS, TEXAS

Front row, left to right: ***Paul Humphries, financial secretary; and Buddy Hoyleman, treasurer.***

Back row, left to right: ***H. D. Hill, Jr., recording secretary; J. J. Schaefer, president; Luther Clark, executive board; I. A. Pres. Walsh; Harvey Hill, business agent; Clarence Holt, vice-president, and Leon Saucier, trustee.***

● M. H. Snow, charter member of Galveston, Texas, Local No. 305, was presented with a gold life membership card at a testimonial dinner recently tendered him by the members of his local. The dinner was attended by the entire membership and many personages prominent in local theatrical, civic and labor circles. The presentation was made by Carl H. Mahlitz, president of Local 305.

Snow is a member of the 25-30 Club and is one of our pioneer projectionists. He has had an intimate working acquaintance with many of the old-time projectors—the Two-Pin Edison, the improved Exhibition Model Edison, Powers Five and Six, and many others. Because of ill health he retired from active duty in November 1943.

● We had a very interesting chat with Ralph McClelland, member of Local No. 461, St. Catherines, Ont., Canada, when he visited our offices the other day. Although 461 is a small local, it is very progressive and its officers are very much on the alert. We understand that all contracts signed by this local carry the clause calling for one week's vacation with pay for its members.

● Another feather in the cap of Gene Atkinson, business manager for Chicago Local No. 110. The new contract recently signed with the Schoenstadt circuit (ten theatres) calling for increases totalling $29,788.80 plus one week's vacation with pay, was approached by the War Labor Board and became effective at once.

● We are deeply grieved to learn of the untimely death of our old friend, Andy Seeley, of Local No. 376, Syracuse. When we saw and talked with him last, at the recent N. Y. State Proj. Ass'n, he seemed to be in perfect health and splendid spirits. Andy was loved by all who knew him, both young and old.

He will be sorely missed by all his friends and his passing leaves a void in their hearts.

● In addition to his duties as secretary of Local No. 302, Calgary, Alta., Canada and as secretary-treasurer of District No. 12, Duncan B. MacKenzie also serves as president of the Alberta Federation of Labour, and as secretary of the Calgary Trades and Labour Council. For his bread and butter, however, "Pinkie" (as he is known to his friends), operates a projection machine. For relaxation he threatens to take up knitting for sea-sick sailors.

D. B. MacKenzie

● Bob Bird, chief projectionist at the Telenews Theatre in Chicago, and a charter member of Local No. 110, recently died of a heart attack. Our condolences to his family.

● At last we made it! The recent arrival of our first grandchild—a girl, Adele Robin—now makes us eligible for membership in the A. K. Club. Eddie Miller (Houston), Dave Seigel (Toronto), Mike Berkowitz (New York), and our many friends throughout the Alliance who are in the grandfather class, move over.

● Officials come and go in Local No. 306, New York City, but Eddie Stewart, executive board member for more than 28 years, always remains. The reason for this is apparent to all who know Eddie.

Since 1912 he has worked tirelessly for the enactment of legislation for the benefit of his brother members, being instrumental in amending the corporation laws of the state of New York whereby motion picture projectionists are now included in the Workmen's Compensation Law. He is a licensed representative in Workmen's Compensation proceedings, having been appointed by the New York State Department of Labor. Local 306 members who have had occasion to apply for compensation for injuries suffered in their work are very grateful to Eddie for his efforts in their behalf. He is indeed a "friend in need."

Eddie Stewart

● Among the recent out-of-town visitors to the offices of I. P. were Bert Ryde, Art White, and Bob Anderson, of Local No. 233, Buffalo, N. Y.

● George Raaflaub, secretary of Local No. 376, Syracuse, N. Y., was another out-of-town visitor to these offices during the past week. His New York trip was made primarily to straighten out certain matters with the War Labor Board. It also afforded him a chance to watch the football game between his beloved Syracuse University and Columbia. Incidentally, George advised us that Raymond Roe, succeeded the late Andy Seeley as business agent of the local.

● Timothy Joseph Sullivan is the latest addition to the family of Joe Sullivan, the genial secretary of Detroit Local No. 199. The elated parents (they waited fourteen years for the youngster's arrival) are walking on air these days.

● A proud father these days is Morris Kravitz, Local No. 306 business agent. His son, Sgt. Milton Kravitz, was awarded a Bronze Star for bravery in the Normandy fighting. The report accompanying the decoration cited young Kravitz, who was the leader of a communications unit in Normandy which installed and maintained six miles of telephone wire under heavy enemy fire, for bravery in ignoring his personal safety to keep the lines open while the Nazis were only 300 yards away. Sgt. Kravitz is a veteran of the North African and Italian campaigns.

Sgt. M. Kravitz

● Lt. Wallace J. Ceglarek, member of Local No. 199, Detroit, Mich., is now recuperating in a hospital somewhere in England from injuries received during the Allies' D-Day invasion of France. At the present writing we do not know the extent of his injuries, but here's hoping he is well on the road to recovery.

"Never before has the importance of fire prevention seemed more apparent. Fire deaths and injuries increase the manpower shortage . . . The whole miserable business of fire waste can be greatly curtailed if each person will accept his or her responsibility to eliminate the widely known common fire hazards, for the records indicate that they cause most of the fires. We must all create and energize a continuously alert fire consciousness, for the easiest way to control fires is to see that they do not start."

RICHARD E. VERNOR, *President National Fire Protection Assn.*

● It pleases us no end when we hear of this or that I. A. man taking an active part in political matters in the community in which he lives, for it long has been our conviction that organized labor should be more strongly represented in our legislatures.

Herman Gelber

We learned recently of the candidacy of Herman Gelber, president of Local No. 306, New York City, for the office of assemblyman for the 19th Assembly District in Brooklyn, N. Y. Gelber has been an active member of Local 306 for almost a quarter of a century, and has held many executive offices in the local. Under his leadership the union has established an excellent record of progressive democratic activity. The abolishment of assessments, the reduction of dues to a minimum, the old-age pension plan, and the increase of benefits to the membership are a few of the reforms inaugurated under his tenure of office.

Also, in 1943 he consummated in behalf of Local 306 the absorption of an independent group of projectionists, The Empire State Motion Picture Operators' Union, thereby eliminating a troublesome phase of dual unionism which had existed for over 18 years. He has represented Local 306 at a number of New York State Conventions of A. F. of L., and has attended many I. A. conventions as a delegate of the local.

In addition to his duties as president of the largest I. A. local union, Gelber has taken a lively part in the many war drives—War Bonds, Red Cross, United China Relief, etc., and his activities in behalf of the war effort have earned for him the chairmanship of the Film War Service Council.

His keen analytical mind and his ability to maintain the sense of balance whatever the situation may be, plus his natural leadership, are qualities that should carry him far in the world of labor politics.

To you, Herman Gelber, we offer our best wishes. Good Luck.

● Mrs. Margaret Lemaster, widow of Frank Lemaster, former secretary of the I. A., and now a resident of Denver, Colo., was a recent visitor to the offices of I. P. She informed us that the two Lemaster boys are in service—Harry, the older boy, has been fighting in the Pacific area for the past two years, and William, the younger lad, is an instructor of air cadet pilots at the Mustang Army Air Field, El Reno, Okla.

Outlook for Tuberculosis Control

By *HERMAN E. HILLEBOE, M.D.*

MEDICAL DIRECTOR
CHIEF, TUBERCULOSIS CONTROL DIVISION, U. S. PUBLIC HEALTH SERVICE

THE control of tuberculosis was one of the first activities in public health in which the cooperation of the public and professional people led to substantial progress in controlling the disease by the sheer power of public education.

Early successes, however, were destined to encounter stubborn resistance as the disease retreated into strongholds less easy to discover and breach by ordinary methods of attack. The inevitable result will be a lag in the downward trend of morbidity and mortality unless some new development occurs which stirs the public interest and enables us to push ahead again.

Recent scientific advances have awakened public interest in tuberculosis control. New technical developments in X-ray equipment now make it possible to apply this essential tool to millions of the population, instead of only thousands, by means of small film mass radiography —a simple, effective and cheap method of finding tuberculosis early.

The war also has directed our attention to tuberculosis control because of the known increase in tuberculosis in war-torn European countries. Even in this country, all of the conditions favorable to the spread of the disease are present—crowding, fatigue, overwork, increased exposure, and mass migration of working people of low economic status, among whom the incidence of the disease is known to be high.

Although there is not yet any nation-wide increase in tuberculosis mortality in the United States, indications in certain parts of the country are that such a rise may soon become apparent. The stage is set then for a reversal of the favorable downward trend of mortality in this country unless something drastic is done to avert this threat.

During the past two years the Public Health Service, working in cooperation with the state and local health departments and tuberculosis associations, has carried on pilot demonstrations in mass case-finding with small film photofluorography. The great significance of the findings has been the fact that 62 per cent of the cases discovered in our surveys are in the minimal stage of the disease when chances for recovery are excellent with proper care. This is in sharp contrast with the fact that only 10 per cent of persons coming to clinics or physicians for the first time for care are in the minimal stage of the disease.

We are under no illusion, however, that the discovery of one or a thousand or a million cases of tuberculosis will alter the course of the disease in this country unless the newly-discovered cases are given care and treatment sufficient to arrest the disease, or at least prevent them from spreading their sickness to others.

The inter-relationship of poverty, ignorance and disease is nowhere more clearly demonstrated than in the prevalence of tuberculosis. The greatest havoc is worked among low-income groups. The colored population is at the bottom of the economic ladder. No plan to rid America of tuberculosis can overlook the close alliance of poverty and disease in these under-privileged groups of our population.

Among the large numbers of cases revealed by mass radiography, there are more than 130,000 young men and women rejected by the examining and induction stations of the armed forces. Already many veterans of World War II have been discharged because of tuberculosis. These two groups of young people in the principal wage-earning age groups merit special attention in nation-wide planning for tuberculosis control.

Now is the time to attack tuberculosis in every part of the country, with the objective in view not only to control the disease but actually to eradicate it. The foundation for such an enterprise has been laid by the National Tuberculosis Association by its sustained and successful program of public health education. The job can be done if official and voluntary agencies will pool their resources on a local level and make a frontal attack on a broad front.

To achieve our final objective, our immediate aims must be definite and specific. Here is what must be done:

1. Chest X-ray examination for the entire population, concentrating first on the vulnerable groups and the family contacts of newly-discovered cases. This does not exclude the use of pre-X-ray tuberculin testing among selected groups with low infection rates.
2. Follow-up of every case discovered in X-ray examinations, in order to insure clinical diagnosis and proper treatment. This would include supervision by physicians in private offices or clinics, assisted by public health nurses; santorium care; protective supervision after discharge, and rehabilitation where indicated.
3. Periodic examination, including chest X-ray, of persons with inactive disease.
4. Prompt treatment for active cases which can make a good recovery.
5. Strict isolation of open cases to prevent further spread of the disease.
6. Intensified health education activities among the general population, patients and their families. This can well be done by local tuberculosis associations.
7. Expanded research in tuberculosis and public health methods.
8. Financial aid to the tuberculosis breadwinner.

Only if this nation recognizes tuberculosis in all its aspects as of national public concern, as cause of suffering and death, and treats it medically, socially and economically, shall we be enabled to conquer it. If it be so recognized, the outlook for control is encouraging and with hard work and joint effort, eradication is possible within our generation.

RCA FIELD MEN HOLD CONFERENCE ON POST-WAR 16-MM PLANS

A series of conferences has just been concluded by regional sales representatives for RCA 16-mm motion picture sound and projection equipment at the home offices in Camden, N. J. The men met with home office executives and discussed current and post-war distribution plans.

The regional men, who were in Camden for about ten days, are Harry E. Erickson, Chicago; Max Heidenreich, Atlanta, and Raymond A. Hudson, New York. Home office participants included Barton Kreuzer, manager of the sound equipment section; O. V. Swisher, manager of the 16-mm commercial department, and A. G. Petrasek, commercial engineer on 16-mm equipment.

Improving Projector Fire-Valves

By *E. R. PEAKE*

MEMBER, LOCAL NO. 634, SUDBURY, ONT., CANADA

THE magazine fire-valve is one of the most important and at the same time one of the most neglected parts of a projector. With most present-day equipment the fire-valve is built into and forms a part of the magazine or projector head, and as a general rule, a major operation is required to remove or replace it.

A suggestion for improvement here is to make the fire-valve of unit construction, and the complete unit may then be fastened in place in the magazine with machine screws. This makes for easy inspection and cleaning, as the job may be done very simply by removing and replacing the unit as readily as the projection lens may be removed and replaced.

After a period of time, when the valve rollers become worn, the manufacturers' close tolerances are lost and the valves' fire extinguishing efficiency is lost or disappears altogether. With the unit construction, however, the complete valve may be replaced with a new one at small expense and at the same time the useful life of the valve will be increased considerably due to the ease with which the unit may be removed for more frequent inspection. In addition, the danger of scratched prints resulting from worn or "stuck" rollers will be reduced to a minimum.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Head-Sets Connected to Sound Systems

We have had several calls recently due to defective head-sets or cords. If you have any head-sets in your theatres which are used regularly by the projectionists, connect a 500-ohm resistor in each side of the head-set leads. This will act as a limiting resistor and unquestionably will save some calls.—D. L. Turner, *ALTEC.*

Handling Preview Dater Strips

While many ways have been devised for the handling of preview dater strips, here is one of the neatest and best I have seen. Take ordinary gummed paper tape like that used for sealing cartons, about 1¼ inches wide, and by rolling it up with several thicknesses into a paper tube about an inch in diameter, you will have a convenient tube for each dater. They are then labeled on the outside and placed in neat rows in a cigar box or other suitable container where they are free from dust and damage.—C. R. Shepard, *RCA.*

Drive-In Theatre Equipment Kept Dry

Each fall, when we shut down for the year, we close the amplifier racks into a small room with half a dozen layers of heavy wrapping paper. We then take about three sets of electric heater units and connect three units in series, making a total of nine units so connected that they just show red in the dark, so there is no danger of their burning out. These units are placed inside the little boxed-in space to keep them dry and warm. It is possible to run a show, as far as sound is concerned, within fifteen minutes of opening up the equipment when re-opening the theatre after the winter shut-down.—R. H. Hecht, *RCA.*

Adjusting Changeover Knob on RCA PG-139 System

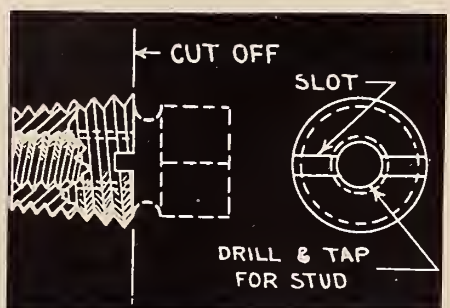
The PG-139 voltage amplifier changeover switching knob that is mounted in the door of the voltage amplifier is engaged to the switch by two pins that engage adjacent slots. I recently ran across a case where these pins were not extending far enough so as to engage. Also, occasionally the sound changeover would be missed and the projectionist would have to run to the other cabinet to make the changeover. I found that there were two nuts on the back of this mounting and by installing one of the nuts on the front of the assembly, or by using a washer, the pins could be made to engage further into the slots.—H. M. Morrow, *RCA.*

Breakage of Pyrex Deflectors in E-7 Rear Shutters

Breakage of deflectors is an expensive and dangerous condition, some projection rooms encountering more of it than others. The projectionist in a theatre that had considerable of this trouble discovered a simple and very effective means for overcoming this condition. He purchased sheet asbestos, the type that is used on hot air furnace pipes, and cut two circles the diameter of the deflector glass, and then cut out the center leaving a ring about one-half inch deep. A ring of the asbestos was placed on either side of the deflector which was then mounted in the holder, thus no metal touches the glass and breakage is avoided.—H. M. Morrow, *RCA.*

Fixing Stripped Threads in Stud Hole For Pad Roller on 206 Jobs

A very satisfactory repair was effected in the case of a 206-type reproducer set that had stripped threads in the pad roller stud holes. One of the vented pipe plugs used in 709 drives was drilled out and tapped to fit the stud and the head cut off even with the last thread. A slot was cut across the plug to fit a large screwdriver. The reproducer set



casting was drilled and tapped for a ⅛" pipe plug, the tapping progressing carefully until the modified plug was flush with the surface when screwed in tightly.—P. J. Aubry, *ALTEC.*

Repairing Tungar Bulb Sockets

In an effort to get perfect contact, some projectionists screw in the tungar bulbs so tight that they literally uproot the screw shell of the socket, pulling it loose from under its mountings and sometimes shorting out the filament secondary so that it becomes impossible to use the emergency a.c. winding.

These sockets can be repaired in the field by obtaining a cleat base porcelain receptacle, and by boring out the rivets the screw shell can be removed from it. With slight modifications to allow the center to straddle the horseshoe mounting cleat, this shell will fit perfectly and make a nice clean job. At the time it is installed, I also solder a jumper from the wire terminal direct to the side of the shell, which will by-pass any possible loose connections caused by the retaining screws.—C. R. Shepard, *RCA.*

Eliminating Soundhead Drive Motors Pound

Recently we had trouble with a drive motor pounding. We found the rear bearing rough and replaced it. The motor still continued to pound. On rechecking, we found that the first ball bearing had locked causing the inner race to slip on the shaft and wear it down a little so that the new bearing was loose on the shaft. If the inner ball race is not tight on the rotor shaft, the motor will pound.

Since I have experienced the above trouble, I have checked the drive motors on several other soundheads and found that the same condition in the front bearing will make these motors run noisy. The proper way to have this condition corrected is to have a motor repair shop build up the shaft and turn it down to the correct size.—R. O. Northrup, *RCA.*

Emergency Gear Repairs

Here are two practical methods for effecting temporary repairs to broken gears where a replacement is not immediately available.

The first, applicable to metallic gears, is to fill in the damaged section with brazing metal, and with a hack saw and

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TELEVISION TODAY

XIV. — CONCLUSION

By JAMES FRANK, JR.

IN THE previous installments of this series television transmitting and receiving systems were described in as simple language as practical. As was stated in the first installment, there have not been very many radical changes in the art of transmitting and receiving since the beginning of the war. While a number of important improvements have no doubt been made to individual parts of the system, not much can be said about them until the end of the war. In this article we will summarize some of the general problems as they now exist with an attempt to forecast certain of the general tren s.

One of the most serious problems at the present time involves a controversy regarding standards. During the past several years new improved vacuum tubes have been designed which make possible the satisfactory transmission of television signals over radio frequencies much higher in the spectrum than have heretofore been used. To adapt television for this new portion of the television spectrum would, however, in the opinion of many engineers, require a considerable amount of additional development work.

Most of the companies with television research facilities are now engaged almost solely in producing electronic equipment for the war effort. They, therefore, will not be in a position to devote time to television, as such, until the end of the war. The present controversy, therefore arises around the question as to whether plans should be made for introducing television commercially in this country shortly after the end of the war in accordance with present standards (described in one of the earlier installments of this series). The exponents of this plan suggest that as television systems utilizing the higher frequencies are perfected a gradual transition should take place so that ultimately all transmitters and receivers would operate in the higher portion of the frequency spectrum.

Recommend Delay

The exponents of the other side of the argument advise the delaying of the introduction of commercial television until the systems have been perfected for use in the higher frequencies. There seems to be considerable differences of opinion as to whether this involves a delay of approximately a year or as much as five years. By following the second plan, it will prevent the introduction and sale of equipment, which might become obsolete within a few years and requires costly replacement. Another point, however, is the harm that might arise by delaying for such a long period of time the commercial introduction of television.

One of the interesting phases of this controversy is the fact that those favoring delay are, in general, concerns which have not very much invested at the present time in manufacturing facilities or transmitters and who would, therefore, suffer least by such a delay. It is anticipated that, in the not too distant future, the Federal Communications Commission, based on recommendations from various groups in the industry, will decide which course is to be followed.

Commercial Television

The projectionists and others in the motion picture industry are, of course, particularly interested in theatre television. Large screen television receivers have been described in this series of articles. Scophony had theatre television receivers in operation in England just prior to the war. RCA demonstrated theatre television in New York City, just before the war. Undoubtedly some improvements have been made in both systems during the war period, and it would seem that theatre television receivers should be available shortly after the end of the war. It is my opinion that the commercial problems involved in the use of television in the motion picture theatre will be more difficult to solve than the technical problems.

Several groups, in particular RKO, are actively concerned in analyzing the commercial problems. It is anticipated that television programs of various types may be made available exclusively to theatres who are equipped throughout the country, either by a coaxial cable network or via radio using an exclusive portion of the frequency spectrum. The point of this sort of an arrangement would be to provide a service to theatres which could not be received in the home by the owner of a home television receiver.

However, a great deal would depend on what kind of programs will be offered to theatres. If, therefore, television is to be used exclusively for outstanding events where the fact that the theatre patron is able to view the program the moment that it takes place in contrast to showing it via the news reel at a later date, it would seem that the number of such events of national significance would be relatively few, and it is a question as to whether the expense for setting up such systems could be justified. After all, political speeches and even "Fire-side Chats" of national significance occur only infrequently. Outstanding sport events such as prize fights, baseball and football games are only few and far between when one considers daily programs. Consequently, it would seem that television involving installations in theatres running costing anywhere from $10,000 to $20,000 each and exclusive transmitting networks would have to depend not only on these outstanding events, but also on regular daily programs.

One-Hour Shows Proposed

One proposal that has been suggested is to offer a service to theatres equipped with television receivers consisting of a one-hour show every night. These shows, which might be either dramatic or of the variety type, might replace the second feature picture. They would very likely be similar to the present outstanding radio programs. The thought is that if the theatres could pay a small charge per seat (possibly involving a higher admission charge for that particular performance) that income could be sufficient to obtain a considerable number of outstanding motion picture and radio performers on a basis which would be so exclusive as to prohibit their participation in motion pictures or radio programs while under television contract.

Personally, I question the theatres' ability for an extended period of time after the novelty has worn off to increase their admission charge for a combination motion picture and television show, and unless they do this, I do not see how they can afford to pay extra over

and above present film costs to present shows of that type.

Another problem that may arise is how many different groups might be offering programs to the theatres, and what kind of arrangement a theatre which purchases television equipment could arrange to get the programs that it desires. Again it seems to be a question of the old vicious circle wherein the exhibitor is not likely to buy equipment unless he is assured of a program and vice versa. I am quite certain that ultimately the question will be solved to the satisfaction of everyone, and it is interesting to note that some of the companies who are outstanding in the amusement field are taking such an aggressive attitude to solve these very important problems.

Another problem at the present time that concerns many people is the effect of the introduction of commercial television upon the motion picture business. It is probable that a certain percentage of programs transmitted by television will originate with motion pictures. However, this is bound to be a small percentage if the interests of the motion picture industry are protected, and if different programs are to be made available for at least several hours of different television shows daily. It is entirely likely that producers of television shows will find ways and means of using 16-mm pictures to a very large extent in the preparation and production of television shows. This, of course, would in no way compete with professional 35-mm pictures.

Theatre Television Preferred

From a psychological point of view, it should be kept in mind that Americans like to congregate in large groups. They occasionally like to get out of their usual environment. They like to go places such as theatres where the seats are comfortable and where the air conditioning system adds to their comfort. It also is a fact that the presentation value of the entertainment is materially enhanced by being in a group of people.

A producer of television shows has recently expressed this characteristic by saying that a large audience acts as a 20-stage amplifier in contrast to a small group of two or three people in a home which is equivalent to a single stage amplifier. It may very well be, therefore, that the average type of show is much better appreciated in a well-filled theatre than in a private living room. Furthermore, there are no distractions to speak of in a darkened theatre, whereas a person in his own living room is likely to be disturbed by other members of the family, door bells and telephones. All this simply means that television entertainment will have to be somewhat different in nature from radio and motion picture entertainment and requires a considerable amount of study and improvement on the part of perspective producers. A great many different types of television productions are now being transmitted over the Dumont station in New York and much valuable experience is being obtained in connection with this activity.

There are many people in the industry who advocate the use of large television images in the home than were available with the majority of the instruments on the market prior to the beginning of the war. This theory is based on contrasting the illusion of a television image in the home to a motion picture image in the theatre. An important factor, in addition to detail of the image, is that in a motion picture theatre there is very little chance to compare the size of the image which might effect the illusion of realism. The screen is fairly well isolated and as long as the image is large enough in relation to the viewing angle it appears to be life-like. It must be remembered, however, that in the home, the viewer constantly and sub-consciously is comparing the television image with the size of objects in the room with which he is thoroughly familiar. This may tend to detract in the illusion of realism.

Several proposals have been made for the use of television instruments which would project the images on either a wall or on a screen similar to motion picture screens so that larger images of at least 2 feet in width will result. Scophony's two television receiver systems employ such projection of the image and Emerson has proposed a home receiver with a 3" cathode ray tube that enlarges and projects the image on a large size wall screen.

Still another important problem which will have to be completely solved before home television can be commercially introduced with entirely satisfactory results is the importance of installing large groups of receivers in a relatively small area, such as an apartment house. It would seem that the only satisfactory way to do this would be through the use of a centralized receiving antenna in view of the reflection problems mentioned in a previous installment. However, it can easily be seen that under certain conditions the use of a centralized antenna is not desirable or practical, and somehow or other this problem will have to be solved.

Distribution of Programs

Of course, one of the fundamental problems in the commercial introduction of television after the end of the war has to do with national distribution of television programs. However, as has been stated before, great strides are now being planned and made for various types of national networks. The American Telephone and Telegraph Company has a comprehensive plan which has been described for the production of coaxial cable networks. They are also constructing a radio relay link between New York and Boston, Mass. The General Electric Company and the International Business Machine Corp. are working on an improved radio relay system between New York City and up-state cities. The Philco Corp. is working on a radio relay link between New York and Philadelphia. All of this activity leads us to

(Continued on following page)

Television May Reach Public Long Before Previous Estimates, Says RCA Executive

APPROXIMATELY 50,000,000 people throughout the country may have sight-and-sound broadcasting six months to two years sooner than even the most optimistic previous estimates, according to Thomas F. Joyce, general manager of the radio, phonograph and television department of the RCA Victor Division, Radio Corporation of America, in an address before the National Association of Broadcasters in Chicago recently. The forecast is based on the supposition that the FCC would grant all of the 63 applications for broadcasting stations on file with it, and that television equipment can be manufactured and installed rapidly.

Instead of original estimates by RCA that television service may cover in three to four years after the end of the war 46 per cent of the potential video market as a result of licenses now on file, Mr. Joyce said that the figures have been revised to 18 months to two years.

In discussing whether present-day television standards are satisfactory he declared that the people who now own home receivers should be considered as best qualified to answer the question. He stated that recent attempts to re-purchase at a liberal price sets now in the hands of the public resulted in 35 out of 36 owners refusing to sell.

The public definitely wants and expects television, he asserted in quoting results of several recent surveys. One, conducted by Newsweek Magazine, showed that 32 per cent of those contacted would be in the market for a television home receiver, ranking second only to automobiles. In a survey made by McCall's Magazine, in the form of a contest, the editors said the results showed that more than two-thirds of all contestants were television home instrument prospects.

Andrew J. Seeley

The sudden death of Andrew J. Seeley, business agent of Local No. 376, Syracuse, N. Y., stunned his many friends in the industry. He died of a heart attack in the projection room of Keith's Theatre on Monday, September 11, a few minutes after reporting for work.

Andy Seeley was a member of Local 376 for over 25 years and enjoyed the respect and confidence of his brother members. His passing is a loss not only to his local but to the entire Alliance, for he was representative of that group of clear-thinking men with a noteworthy talent for straightforward expression and a balanced sense of ethical values that has played such a large part in maintaining the high standards of our craft.

Seeley was born in Avon, N.Y., in 1896, and graduated from the Avon grammar and high schools. He enlisted in the U. S. Navy in World War I, serving as an electrician's mate. After the war he settled in Syracuse and in 1919 became a member of Local 376, holding various offices until February, 1944, when he was elected business agent. At the time of his death he was chief projectionist at Keith's Theatre, having held that position since 1935.

Although he was considered an authority on matters pertaining to the art of projection, Seeley constantly strived to keep up with all the developments in the industry, and two years ago he graduated from Syracuse University where he completed a special course on Electronics. He was a member of the Society of Motion Picture Engineers, and of the 25-30 Club of New York City. Surviving him are his wife, Mrs. Marie Seeley, and a sister, Miss Harriet Seeley.

D. D. PECKHAM NAMED COMPTROLLER OF MANUFACTURE FOR W. E.

David B. Peckham, formerly comptroller of sales of the Western Electric Company, has been named comptroller of manufacture, succeeding the late John M. Stahr. Mr. Peckham's old post will be filled by Clifford W. Smith.

Mr. Peckham became associated with W. E.'s Hawthorne Works upon his graduation from Union College in 1912. He held various supervisory positions in the company's accounting department in New York and in 1929 was appointed superintendent of accounting at the Kearny, N. J., Works; later he was appointed Work's comptroller. In 1940 he was named comptroller of sales.

Mr. Smith joined the Societe de Material Acoustique, French distributors of W. E. sound motion picture equipment, in 1929. He later became European manager for ERPI, former W. E. subsidiary, and in 1936 he returned to the United States to become general foreign manager of ERPI's export division in New York. In 1938 Mr. Smith assumed his duties as ERPI's general manager on the West Coast and he returned to New York in 1942 as assistant comptroller of sales.

TELEVISION TODAY

(Continued from preceding page)

believe that by the time the war is over and commercial television is ready, the means will have been perfected for nationwide television broadcasts.

Summarizing, I think it is safe to say that, from a technical point of view, television has for the most part reached the point where it is ready for commercial introduction. Apparently the perfection of color television is several years off. Undoubtedly, ultimately the use of the higher frequencies for television than have heretofore been used will become an accomplished fact. What results in the intervening period remains to be seen. The several commercial problems regarding both home and theatre television will, of course, have to be solved, but it is encouraging to note the progressive interest and activity on the part of many people in the industry to insure the accomplishment of this objective in the not too distant future. It appears certain, as well, that the engineers of the various television manufacturers will be ready to devote their full attention to the further development and perfection of television when the war is over.

S.M.P.E. ABSTRACTS

(Continued from page 9)

may find this situation rather unusual.

In the post-war world, however, many of them may be called on to set up production facilities in South America, China, South Africa and other countries where they will run into just these problems. They may have to organize and train production staff in record time. They may have to turn out many films with little equipment. They may have to establish standards in a field where only the most rough-and-ready methods had been used before. The similarity of the Canadian project may therefore give it even more than the friendly attention with which U. S. engineers have helped us time and again up in Canada when unusual technical difficulties arose.

The paper will give a short historical summary of the Film Board, describing its setting up in the early part of 1939 to coordinate all Government film activities, to produce all Government pictures except where it decided that they could be more effectively made outside, and to supervise the distribution of non-theatrical films throughout Canada. The paper will say something about the distribution machinery which has set up 40 regional film libraries and organized more than 120 mobile projection units in rural and industrial areas. The operators of these units are not merely projectionists; they organize local discussion groups, distribute information about films, and in general arouse interest in movies as a means of encouraging a keener civic sense in the community. The Distribution Department, working through Canadian legations and trade outlets abroad, also makes films available in South America, South Africa, Great Britain and many other parts of the world.

The next section will be devoted to tracing briefly the technical growth of the Film Board from an organization comprising only 40 people in 1941 to its present staff of 500 running a modern and efficient self-contained producing organization with its own laboratory, optical and special effects department, animation department, and so on. Main stress will be laid on the fact that there has been a deliberate trend away from specialization. Production staff has been able to get as close an acquaintance as possible with the work of all technical departments. Technical personnel, in turn, has been encouraged to learn about problems of production. This has meant an interchange of staff between different departments with a consequent stress on training and retraining. But it has resulted in the building up of a group of film craftsmen with a remarkable amount of versatility and the ability to turn their hand to a number of specialized jobs.

APPLICATION OF SOUND RECORDING TECHNIQUES TO AIRPLANE VIBRATION ANALYSIS

J. C. Davidson and J. G. Frayne

Elec. Research Products Division
Western Electric Co., Inc.

This paper describes methods which have been developed for analysis of the various vibration components present in airplane structures. The complex wave forms are recorded on standard motion picture sound negatives during flight. These films later, after proper development, are analyzed electrically, making possible a complete analysis on the ground and thereby reducing materially the time devoted to flight test and also simplifying the process of analysis of complex wave forms. The technique described

makes possible a permanent record of the conditions obtaining during the particular flight under examination which may be subjected to review at any future date.

PRACTICAL UTILIZATION OF MONOPACK FILM

Charles G. Clarke
20th Century-Fox Film Corp.

Practical use has been made by the author of the Eastman Monopack 35-mm color film in photographing the current 20th Century-Fox Film production "Thunderhead".

In this full length feature production every scene was made on Monopack film including interior sequences, process shots, special effects and all of the exterior scenes. These latter were made under all variations of light conditions, and an extremely wide range of background material.

The paper presents some of the problems encountered; the production techniques used, and benefits obtained by using this method of making motion pictures in color.

TWO NEW EASTMAN FINE GRAIN SOUND RECORDING FILMS

R. M. Corbin, N. L. Simmons, and D. E. Hyndman
Eastman Kodak Company

Eastman fine grain sound recording film types 1372 and 1373 have been introduced recently to the motion picture trade. Type 1372 is a variable area film having high contrast and with capabilities of producing a high degree of image sharpness. This emulsion may be used for recording with ultraviolet or white light with very little difference in sound quality. High energy developers are not necessary for the development of this film due to the inherent image sharpness. Type 1373 is a variable density film designed for development in a normal picture negative developer. The use of special low energy developers is therefore avoided. Test data are presented for these two films.

THE DENSITY OF MODERN REVERSIBLE COLOR FILM

Monroe H. Sweet
Ansco, Binghampton, N. Y.

Sensitometric procedures for modern multilayer reversible color films are much more exacting than those for black-and-white films. The tolerances for exposing and processing these materials are smaller and the analysis of the results is more difficult.

The problem of evaluating the finished sensitometric strips in terms of the color densities of each step has been facilitated by the construction of a special form of direct reading densitometer. An electron multiplier phototube, coupled to the grid of a logarithmically responsive triode tube, supplies the extreme sensitivity necessary to read high color densities with satisfactory spectral purity.

AIRPLANE VIBRATION RECORDER

J. C. Davidson and G. R. Crane
Elec. Research Products Division Western Electric Co., Inc.

This paper describes a portable film recorder capable of simultaneously recording 13 variable area tracks on 38-mm film. It is intended for use in the analysis of airplane vibration or similar studies in which it is desirable to record disturbances (mechanical, acoustical or electrical) from a number of sources in such a manner that the resultant record can be analyzed for frequency, amplitude and phase relation. Film speeds of 12, 6 or 3 inches per second are available.

AIRPLANE VIBRATION REPRODUCER

G. R. Crane
Elec. Research Products Division Western Electric Co., Inc.

A reproducer set designed for use in the reproduction for analysis of multiple track film recordings is described. It is capable of reproducing simultaneously 13 variable area tracks recorded side by side on standard 35-mm film. Recorded signals between five and 3000 cps are accurately reproduced and may be analyzed for frequency components, amplitude and phase relation.

NOTES ON THE DUPLICATION OF 16-MM INTEGRAL TRIPACK COLOR FILMS

Wm. H. Offenahuser, Jr.

In the early days of Edison's work with motion pictures, it seems that he, too, would indulge in that kind of day-dreaming "Wouldn't it be wonderful if—." There is ample evidence that Edison finished his sentence with the words "— we could have both color and sound in educational motion pictures." Edison's day-dreaming is a reality today, if we choose to use the materials and processes already available.

Kodachrome can be considered a successful process. Although its photographic speed is somewhat slower than black-and-white

AT YOUR SERVICE

(*Continued from page* 21)

file cut the required new teeth. Only a rough approximation of the original tooth profile is necessary, the brazing metal being sufficiently soft to wear rapidly to the proper contour. This operation is not nearly as difficult as it sounds—a P-464380 Pinion with two broken teeth has been repaired by this method in approximately one-half hour.

The second method, applicable to any gear but particularly adaptable to fiber or composition gears, is to drill and tap one or more holes, depending on the width of gear face, centered in the root of the broken tooth, seat firmly the screw or screws whose diameter should approximate the thickness of the gear tooth, and then file the screw to the approximate gear tooth contour.—E. G. Hemenway, *ALTEC.*

Improved Position for ERPI Spare Parts Cabinet

By mounting the ERPI spare parts cabinet upside down, a lip is provided on the upper side of each shelf preventing round objects from rolling off. More usable space is provided and the recessed top is an advantage.—J. A. Day, *ALTEC.*

Lateral Weave in Simplex Soundheads Corrected

I have had several cases of lateral weave in Simplex soundheads recently which have been traced to end play in the stabilizer shaft caused by loss of tension in the spring washers between the stabilizer wheel and the bearing. Two of these washers are provided with the equipment. If the end play is excessive, the convex sides of the washers should be placed together to increase the tension.—A. H. Clow, *RCA.*

Installing Improved Changeover Switch on Old Systems

In older installations where telephone type switches are used for sound transfer frequent trouble indicates that replacement is necessary. In such cases I order the Yaxley type stock No. 26290 switch and install it with a fader rod. This switch is cheaper and easier to service and allows greater operating convenience. In all cases the projectionist prefers the extension rod to the older method of pulling a string.—Frank Adams, *RCA.*

Improved Operation of Western Electric 12A-12B Rectifiers

The waiting time while a 314-A Western Electric vacuum tube or an 83 is warming up in the Western Electric 12A or 12B rectifier is important when the theatre is full of customers. This may be avoided and better results and longer tube life may be obtained by a fairly simple modification. I am not giving dimensions or actual procedure at this time; these can be worked out at the installation.

There is room on the end of the chassis of the rectifier to mount two tube sockets by cutting out a rectangular hole and mounting the sockets on a template which is then bolted to the chassis over the hole. There is also room under the chassis to mount a separate heater transformer. This can be placed in any convenient

location and wired to the a.c. supply of the rectifier and to the heater contacts of one of the two tube sockets. The other socket remains wired standard except for the plate connection.

The plate circuit is carried through a double-pole double-throw toggle switch mounted on the front of the chassis so that it doesn't interfere with the cover and is wired to the plates of the two rectifier tubes. The circuit wiring details are readily apparent. In operation the filament of one tube is energized while the other is in use. A change can be made instantly from one rectifier tube to the other by throwing the toggle switch without the loss of a word. The projectionists are instructed to run on one rectifier tube for a week and then on the other for a week. Tube life is thus greatly prolonged and tubes are not lost through improper heating.

Incidentally, the regular filament plate switch stays in the circuit and is used as intended on starting up and shutting down. I have used this modification for over two years with excellent results.—TED DEVORE, *RCA*.

Rust Preventive

Rust prevalent on 959 Universal joints and other steel parts may be caused by condensation during change in temperature. The Delta Machine Company, of workshop fame, puts out a very good rust preventive which sells at 50c a pint. If their rust remover is used before applying the preventive, care must be exercised to immediately replace the oil film which the remover destroys.—FRED A. MANLEY, *ALTEC*.

Adapting a Western Electric KS-6607 Optical in a DeForest Sound System

I found that a Western Electric KS-6607 optical system can be used in the DeForest soundheads by removing all elements from the DeForest optical and sliding the complete Western Electric KS-6607 into the DeForest lens barrel. Reproduction from the above modification results in much better sound.—C. W. STELLING, *RCA*.

Rubber Motor Mounting Installation

The first time I tried to change a rubber motor mounting I really did sweat, bruised my fingers and lost my temper. The next time I took a pair of ordinary "C" clamps, hack-sawed the back of them a little so that they went through the end bell holes. In this way the end bell can be hung over the side of a bench and the clamps tightened on opposite sides of the clamping plate against the rubber cushion. Equal pressure is exerted on each side and the wire retainer can easily be slipped in or out of the groove with a screw driver.—TED DEVORE, *RCA*.

A Friendly Tip

The Projectionists' Service Manual, published by I. P., now off the press about a month, has proven the book of the year to the craft. Heavy mail orders have been received for it singly and in bulk. Apparently most projectionists want to be assured of their copy. The limited edition, however, is fast dwindling, and as there will be no second edition this year at least it is not amiss to caution those who still have not ordered the manual to do so now.

S.M.P.E. ABSTRACTS

(*Continued from page* 26)

films, it is almost as convenient to use in the ordinary 16-mm camera. Like all color processes, however, it has its limitations which, if not understood, may lead to unnecessary disappointment; however, these may be avoided.

It must be recognized at the outset that there is no "perfect" color process. The usual requirements for a satisfactory color process include:

(1) A suitable grey scale and comparable color-density scales.

(2) Accurate reproduction of color.

(3) Good differentiation of color.

Unfortunately with present integral tripack films each of these requirements conflicts with at least one of the other two. If these simple facts are recognized, it is immediately apparent that "run-of-the-mine" duplication cannot fulfill the requirements of all three. Ordinarily No. 1 and No. 3 are favored over No. 2, and the result is quite satisfactory for practical purposes.

Unfortunately, in medical work, where accurate reproduction of color is often desired for diagnostic and similar purposes, some of the very common biological stains are not reproduced satisfactorily, in integral tripak color films. In such cases, and in other specialized cases where the absorption spectra are "unfortunately" located, color accuracy must knowingly and intentionally be sacrificed for color differentiation.

Some transmission curves of materials whose characteristics have not been previously published are given. Much of this material has been used commercially for several years and has been helpful in solving, in a practical way, some of the duplicating problems that arise in the course of everyday commercial laboratory work.

8,000 PICTURES PER SECOND

H. J. Smith
Bell Telephone Labs., Inc.

The factors involved in the successful design of a high-speed motion picture camera with a maximum taking speed of 8,000 pictures per second are described. This camera is of the rotating compensating prism type, with continuously moving film. The pictures taken with this camera are 8-mm frame size on 16-mm film and can be viewed with any standard 8-mm projector.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933,

Of INTERNATIONAL PROJECTIONIST, published monthly at New York, N. Y., for October 1, 1944.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared R. A. Entracht, who, having been duly sworn according to law, deposes and says that she is the Business Manager of INTERNATIONAL PROJECTIONIST and that the following is, to the best of her knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, International Projectionist Pub. Co., Inc., 19 West 44 Street, New York 18, N. Y.
Editor, W. L. Lightfoot, 19 West 44 Street, New York 18, N. Y.

Managing Editor, None.

Business Manager, R. A. Entracht, 19 West 44 Street, New York 18, N. Y.

2. That the owner is:

International Projectionist Pub. Co., Inc., 19 West 44 Street, New York 18, N. Y.

R. A. Entracht, 19 West 44 Street, New York 18, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

R. A. Entracht, Business Manager

Sworn to and subscribed before me this 9th day of October, 1944.

(Seal) BERNARD SCHWARZ

Notary Public, New York County Clerk's No. 149, New York County Register's No. 196-S-5.

My commission expires March 30, 1945.

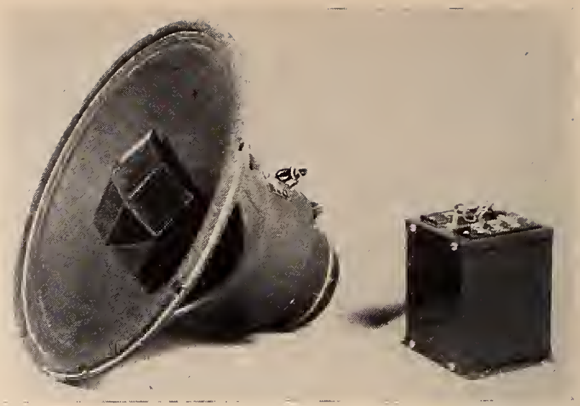
DUPLEX LOUDSPEAKERS

(*Continued from page 15*)

of being operated over a wide voltage range with negligible change in their inductance value. The networks are not affected by their proximity to other apparatus. The assembly shown has been used with various shapes and sizes of resonated baffles, but most satisfactory results have been achieved when a baffle with a volume of 6 to 9 cu. ft. was used. A 6-cu. ft. baffle when properly ported* will permit good response down to 60 cycles. A 9-cu. ft. baffle will permit good response down to approximately 40 cycles. Care must be taken in the construction of the baffle to prevent "breathing" effects from the pressure built up in it at the lower frequencies. The inner wall of the baffles must be covered with sound absorbent material in order to prevent reflections which would give a "hang-over" or "echo" effect.

FIGURE 5

Duplex Loudspeaker and its dividing network.



Comparative tests of the Duplex Loudspeaker with the larger systems have been highly satisfactory as to reproducing characteristics and efficiency. At a distance of 2 ft. from the new unit, all frequencies being reproduced appeared to come from a single source. The high-frequency radiation angle of 60 degrees by 40 degrees is small enough to avoid reflections from the baffle as the sound leaves the high-frequency horn, but is still ample to permit the listener to move about with considerable freedom.

The uniform characteristics which can be maintained from unit to unit should make the Duplex Loudspeaker ideal as a monitoring standard. The elimination of vertical spacing between the source of high frequencies and the source of low frequencies brings about a point source of reproduction which is found to be very realistic and helpful in the critical judgement of quality.

* The port is used to allow the energy which is radiated from the rear of the cone to be admitted out the front side in phase with that portion of the energy coming from the front of the cone. The effect is to maintain a more constant acoustic impedence down to the cutoff of the enclosure. The area of the port is a function of the size of the box enclosure and the mechanical resonance of the loudspeaker unit.

REFERENCE

[1]BEERS, G. L., and BELAR, H.: "Frequency Modulation in Loudspeakers," *J. Soc. Mot. Pic Eng., April* 1943.

F. M. WILLIAMS RETIRES

F. M. Williams, general installation engineer of the Western Electric Company, has retired under the company's pension plan as of October first, and is succeeded by E. N. Searles, superintendent of results and industrial relations.

Mr. Williams has been with the company for 35 years, joining it as an engineering apprentice in 1909 after receiving his A.B. and E.E. degrees at the University of Minnesota. He rose through various positions of responsibility and became division chief of both manual and panel dial engineering in 1920. In 1923 he became superintendent of equipment engineering at the Hawthorne Works, and in 1927 was appointed to his post as general installation engineer at New York headquarters.

Mr. Searles took up his new post with a long and diversified background in the field of installation, having entered the company's employ in 1911 at the Los Angeles installation department. He has been division foreman and district superintendent in Los Angeles, and later was made division superintendent of the Cleveland installation division, continuing in that post until 1943 when he was appointed superintendent of results and industrial relations at New York headquarters.

Official U.S. Signal Corps Photo

Let these guys start it!

There's a day coming when the enemy will be licked, beaten, whipped to a fare-thee-well—every last vestige of fight knocked out of him.

And there's a day coming when every mother's son of us will want to stand up and yell, to cheer ourselves hoarse over the greatest victory in history.

But let's not start the cheering yet.

In fact, let's not start it at all—over here. Let's leave it to the fellows who are *doing* the job—the only fellows who will *know* when it's done—to begin the celebrating.

Our leaders have told us, over and over again, that the smashing of the Axis will be a slow job, a dangerous job, a bloody job.

And they've told us what our own common sense confirms: that, if we at home start throwing our hats in the air and easing up before the job's completely done, it will be slower, more dangerous, bloodier.

Right now, it's still up to us to buy War Bonds—and to *keep on* buying War Bonds until this war is completely won. That doesn't mean victory over the Nazis *alone*. It means bringing the Japs to their knees, too.

Let's keep bearing down till we get the news of final victory from the only place such news can come: the battle-line.

If we do that, we'll have the *right* to join the cheering when the time comes.

Keep backing 'em up with War Bonds

INTERNATIONAL PROJECTIONIST

NOVEMBER 1944

VOLUME 19 • NUMBER 11

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6th WAR LOAN

INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

"BARBED-WIRE BOREDOM," experienced by American prisoners of war held by the Germans, is being relieved considerably through films provided for them by War Prisoners Aid. These films are the gift of the American motion picture industry in cooperation with the Army Overseas Motion Picture Division. They have been finding their way into war prison camps in occupied Europe, with neutral representatives traveling from Geneva through Germany to Stockholm delivering the 16-mm film and projection equipment in accordance with an understanding between the belligerents. Since January 101 Hollywood features have been received at Geneva.

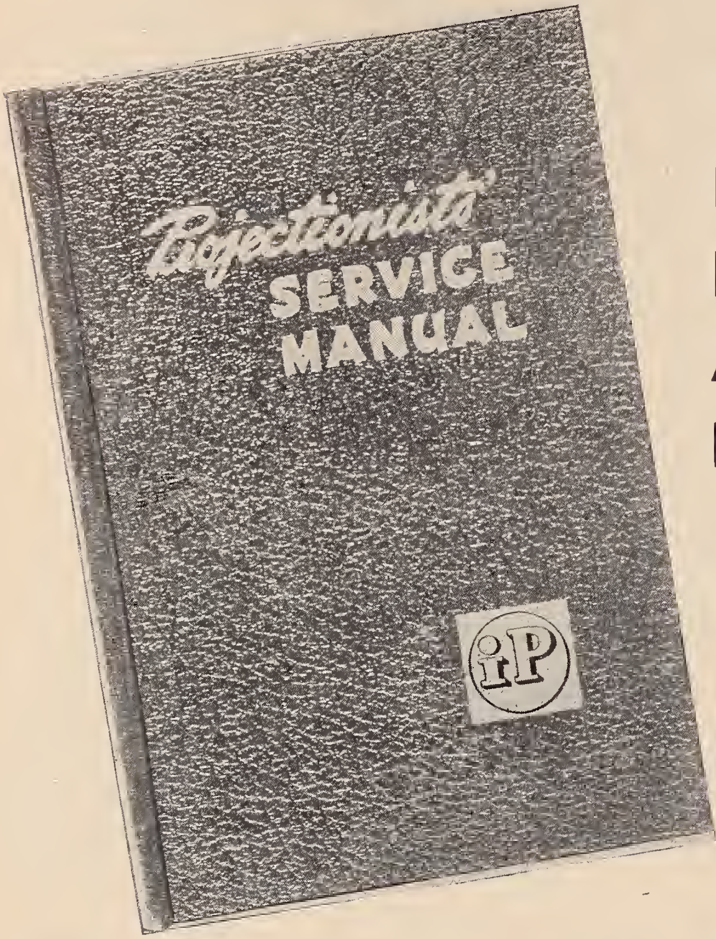
• • •

The film producing industry has increased its output about 45 per cent over the 1941 rate to meet military and essential civilian requirements, and still there is not sufficient film available. More 16-mm film is used by the Army and Navy, in terms of screen time, to make training pictures than is used by all the motion picture producers of Hollywood, with 16-mm film production alone being seven times the 1941 rate. Through the use of motion pictures service men and women are taught to use and repair military equipment, to meet emergencies in battle, and to recognize enemy equipment. With the aid of motion pictures, men in the armed forces learn to shoot—and hit—all types of targets under simulated battle conditions. By means of films, too, battles are recorded and enemy positions and techniques are analyzed. There is a need, however, for film conservation, even though material shortages have not yet hindered production to any great extent. The need is expanded as the Pacific war area spreads out. Materials used in the production of film are mainly the same materials that are used to make smokeless powder.

• • •

Progress of the European and Japanese wars may lead some people to believe that the war is almost over and that pressure for War Bond purchasing during the current Sixth War Bond drive has been lessened. This, however, is far from being true. The need is as great or greater than ever, but every dollar loaned actually will shorten the hostilities. In case you are a Doubting Thomas with reference to the foregoing digest the statement just made by the War Department to the effect that it is going to cost almost as much to fight Japan alone as it did up to now to fight both Germany and Japan. That fact alone is sufficient to influence everyone to dig deep and quickly bring about over-subscription of the country's present fiscal needs.

YOU NEED THIS BOOK!



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INTERNATIONAL PROJECTIONIST

VOLUME XIX NOVEMBER 1944 NUMBER 11

Soldering in the Projection Room

By *HENRY B. SELLWOOD*

FEW jobs about the projection room seem to be done as poorly as soldering, yet few are easier to do right. The requirements of good soldering do not stop at the connection to be made. They relate also to surrounding parts, particularly to nearby insulation, and sometimes also to connecting wires. Some of the new wartime solders, which are very poor, aggravate normal difficulties and increase the percentage of troubles resulting from faulty techniques.

The fact is that solder is used in many different trades and manufactures; and a method that is found successful in some other application may be very faulty in the projection room. Projection room requirements differ somewhat from the requirements of the factory in which the projection room apparatus was first made, and they differ a great deal from the requirements of the telephone exchange on the one hand or the electrical trades on the other.

One of the difficulties about good soldering is in getting the correct degree of heat applied properly, and here some of the new wartime solders raise particular trouble. Most projection rooms have a single soldering iron which is used for all jobs, and a single soldering iron cannot do all jobs—and do them well.

Heat Problems

There are three general heat faults: (a) inadequate heat; (b) heat applied at the wrong places; (c) heat applied *too slowly.*

As for the adequacy of heat—it must be great enough to melt the solder completely to a pure liquid, not half melt it to a gummy paste. Solder, normally, is a mixture of two metals—tin and lead. The proportions of this mixture vary according to the type of solder. Plumbers' solder or "hard" solder consists of 50% tin and 50% lead, and many projection room irons will hardly melt it. Peacetime solders as used in the projection room had more than 50% tin. The emergency shortage of tin has resulted in manufacture of solders with a high lead content, or with other metals substituted for tin, and many of these "ersatz" solders don't melt so well.

Now if the solder is *half* melted the metal with the lower melting point goes completely to a liquid while the other metal or metals remain solid until the temperature has been further increased. At in-between temperatures the solder presents the pasty characteristics that everyone has noted while it is in process of melting and while it is re-solidifying. During this time it is neither a liquid nor a solid, but a kind of mixture of both. Tin melts at 446° F. while the melting point of lead is 620° F.

If the solder is not melted completely —to a full liquid—it can't produce a good connection. So much for the adequacy of the heat.

If the first problem in connection with heat is to get enough of it, the second problem is to get it at the right place—and the right place is *not* the solder, it is the object to be soldered.

The solder may be reduced to so complete a liquid that it can be dropped on the subject to be soldered, and still not be a liquid *at the point of soldering*, because the object to be soldered may be large enough to chill the solder on contact. Thus it is easy to produce a bead of solder, completely liquid to all appearances, which lies on the object to be soldered, and the under side of that bead, the invisible portion actually in contact with the object, may have been chilled by contact to below the liquifying temperature. In such cases, there is no soldered connection. There is a "cold joint."

Poor Connections

In some instances, after the bead of solder cools all over, it can be picked off with the finger nails. In more troublesome cases the chilled solder will wrap itself around a wire or other object and thus cling in place because it has locked itself in place, and yet there will not be a real solder connection. In addition, the junction will tend to produce noise if it is in a sound circuit, and also will deteriorate.

If a small wire is to be soldered to a small lug it is possible to pick up a bead of solder with the tip of a hot soldering iron, deposit the bead of solder on the cold wire and the cold lug, and a good joint may result. That is, when the bead of solder is large enough to heat the

wire and lug, instead of being chilled by them, which only happens when wire and lug are fairly small. In a factory, where the same operation is repeated thousands of times, a reliable technique of that kind can be worked out for some operations and it is very quick and easy. But it cannot be used safely unless tests and experience show it is safe for that particular operation. No such method should ever be used in the projection room.

The heat should be applied to the parts to be soldered, and those parts then permitted to melt the solder. This is absolute assurance that they will not chill the solder and that a cold joint will not result.

The clumsiness of trying to hold a soldering iron in one hand and solder in the other, while nudging the wire into place with an odd finger or so, is responsible for attempts to use faulty short-cuts in method. The urgency of time in the production room when emergency repairs have to be made while an audience is waiting, is another reason for trying faulty short-cuts. How to keep wires and so on in place for soldering will be referred to further on; if a short-cut method has to be used to save time the job should in all cases be done over again and done right after the show ends.

Apply Heat Quickly

The third problem relative to heat—applying it fast enough—grows out of the situation just referred to, the necessity of letting the parts to be connected melt the solder. Sometimes those parts will not hold the heat the iron applies to them. Metals are good conductors of heat. If the stud or lug or wire is in intimate metallic contact with a large mass of metal the heat may radiate away from the point of application so fast that the point where the heat is applied may never be brought up to the needed temperature.

Under such circumstances the natural tendency is to keep the iron on that point a little longer, with the feeling that eventually it will get hot enough. Perhaps it will. But in the meantime all the neighboring parts will also get pretty hot. Insulation may coil or crack or buckle—some types may char—some types may even burst into flame. Very thin wire, such as the winding of some transformers, may melt and open-circuit as a result of the effort to reach adequate soldering temperature by *prolonged* application of heat.

The method is faulty. If the parts to be soldered do not get hot enough to melt the solder within a few seconds after the hot iron has been applied to them, don't keep the iron in contact and saturate half an amplifier with heat. Use a larger iron.

Particularly with some of these new wartime solders, it may even be necessary to use a small alcohol torch.

There are few faults that cause more trouble than trying to get sufficient heat from an iron that is too small to supply the required heat *fast enough.* Remember this—when you apply a soldering iron and heat metal, the metal simultaneously is chilling the iron. If the iron is small and the metal parts to be heated are bulky or in contact with large bulks of metal, it may be impossible to heat them adequately, or it may take so long to do that all neighboring parts of the apparatus are saturated and injured by heat. Always use an iron large enough for the job.

Soldering Iron Problems

However, if the iron is too large, and especially if it is used in cramped surroundings, the same type of bad results may follow. The iron may be so large, so bulky, that it will come into contact with neighboring insulation, or else char or dry it out merely by reason of the excessive heat radiated.

The iron should be of the right size, neither markedly too small or materially too large. And different jobs, in different places about the apparatus, require different size irons.

If the right size iron for a given job is not on hand and can't be obtained or borrowed good workmen try to remove the parts from the apparatus entirely. Thus a socket or transformer may be removed from an amplifier, a wire soldered to it, and the part restored. This practice is greatly simplified, of course, if the part is equipped with removable lugs. In that case all that is necessary is to take the lug from the transformer or socket, solder to the lug, and restore the lug again.

But there are many cases where details of construction, the length of wire to be connected and so on, make this practice impossible. It is therefore highly desirable to have more than one type of soldering iron in the projection room.

Where the alcohol torch is used it is particularly important to remove the parts to be soldered from their apparatus whenever that is possible. The flame is much hotter than the tip of any iron. Where the parts must be soldered while remaining in place successful work can be done, without harming neighboring insulation, by adjusting the flame to the finest possible pin-point tip. Different alcohol torches are adjusted in different ways, but all can be adjusted to give a moderately fine flame-tip, and some can be made to produce almost a needle-tip.

The soldering iron itself should be kept in first-class condition by periodically filing, tinning and smoothing the tip. It is best, and avoids trouble, to tin only one side.

The four-sided tip is clumsy in sound work. With a file, flatten the tip to the approximate appearance of the end of a screwdriver. File *one* side of the flat surface clean, touch it with rosin-core solder, and wipe off all excess solder with a folded rag. One side of the iron will then be tinned, and will hold and carry beads of solder. The other side will not be tinned, will not pick up or carry solder, and therefore will not accidentally deposit solder where you don't want it. If, in the course of using the iron, one side accidentally acquires tinning (which it will do in time) go over the tip again with a file and rag as described above, until it is again in perfect condition for the best work.

A soldering iron tip does not stay in perfect condition when it is used—it must be reconditioned frequently.

In addition to the heat problems of good soldering, there are the questions of holding the parts to be soldered in proper place, and the use of flux.

Parts Held in Place

With respect to holding the parts in place, it is the practice in many trades to fasten them in place, as, for example, by wrapping a wire around a lug. Some of the best soldering is done that way; it is standard practice in the innumerable soldered connections of telephone work. But it is not a good method for the projectionist, who may do a little soldering once in six months. It is not good practice because there is no good way to test the finished connection. If the wire is *not* fastened physically, but only held by the solder bond, the connection can be tested by trying deliberately to break it. If the soldering was well done it will be at least as strong as the wire, and if the wire is strong enough to lift the whole apparatus then you can lift the whole apparatus by it and the soldered connection will not come loose. Whereas, if the wire is physically wrapped around a binding post the worth of the connection cannot be tested.

However, it is a mistake to try to *hold* the parts in place for soldering; *fasten* them in place in some way that can be undone for testing purposes after the joint has been made. Lay a pair of heavy pliers on the wire to hold it down, or tie it in place or use any method at all that is convenient for the job in question.

Trying to hold the parts in contact is bad technique for two different and distinct reasons, both important. One is that holding parts with one hand, a

(*Continued on page* 24)

Summation of SMPE Statement Before FCC on Theatre Television

THE Society of Motion Picture Engineers, in behalf of the engineers of the motion picture industry, recommends that the Federal Communications Commission consider the need for providing adequate frequency band allocations for a national theatre television service, such frequency band allocations to be on a parity of opportunity with the frequency band allocations allotted to television broadcasting, above 300 megacycles.

For the immediately necessary postwar initiation of this new theatre television service it is recommended that a frequency band of 1,500 megacycles in groups of contiguous 20 megacycle channels be allotted to this service as follows:

1. 8 contiguous 20 mc cleared channels or a band of 160 mc from 600 to 760 mc.
2. 7 contiguous 20 mc cleared channels or a band of 140 mc from 860 to 1,000 mc.
3. 15 contiguous 20 mc cleared channels or a band of 300 mc from 1,900 to 2,200 mc.
4. 15 contiguous 20 mc cleared channels or a band of 300 mc from 3,900 to 4,200 mc.
5. 30 contiguous 20 mc cleared channels or a band of 600 mc from 5,700 to 6,300 mc.

The frequency allocation chart graphically indicates those frequency band allocations compared with frequency band allocations for television recommended by IRAC, and frequency band allocations for television and relay, requested by Panels 6 and 9 respectively, of the Radio Technical Planning Board.

The frequency band allocations requested by Panel 6 for television included the request that experimentation be permitted in the frequency bands requested above 300 megacycles and that such experimentation included theatre television. The frequency band allocations requested by Panel 9 for relaying includes requests made by the Society of Motion Picture Engineers to that Panel for frequency band allocations for theatre television. On the basis of these requests to Panels 6 and 9, for theatre television service, the specific frequency bands now recommended by the Society of Motion Picture Engineers for theatre television are reasonable and on a parity of opportunity basis with television broadcasting above 300 megacycles.

The Society of Motion Picture Engineers earnestly and respectfully recommends that the frequency band allocations requested in the group C channels between 300 to 1,000 megacycles for theatre television be made immediately available to theatre television by the Federal Communications Commission, whenever the Commission grants an allocation in this group C channel for television broadcasting or relay service. This request is made to insure that theatre television will not be handicapped in its initial experimentation.

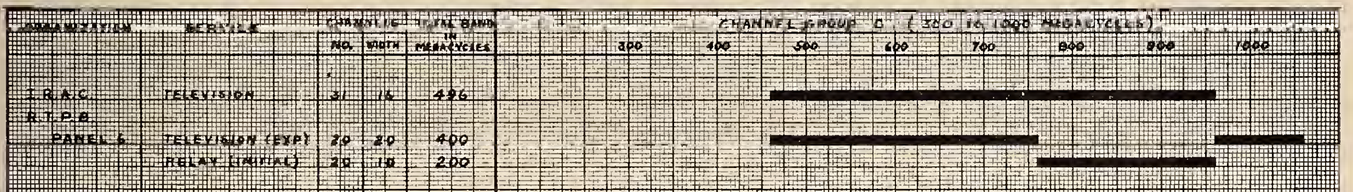
Equipment capable of operation at frequencies within group C channels has been developed and undoubtedly will be commercially available immediately upon release of the present wartime governmental regulations. Equipment for operation on frequencies above 1,000 megacycles is not commercially developed and therefore will not be available upon such release. The motion picture industry should not be handicapped in its desire to initiate this new industry promptly after release of wartime regulations.

The Society of Motion Picture Engineers also wishes to direct the attention of the Federal Communications Commission to additional frequency band allocations which may eventually be required for the ultimate fully expanded theatre television service. The extent of such additional frequency band allocation requirements to be determined after the initial experimental field tests of theatre television.

The Society of Motion Picture Engineers also directs the attention of the Federal Communications Commission to the fact that theatre television involves communications of a private nature and therefore should be accordingly classified to differentiate it from television broadcasting.

The Society of Motion Picture Engineers, in behalf of the engineers of the

(*Continued on page* 30)



Television Frequency Allocation Requests Presented by Society of Motion Picture Engineers.

Procedure for Making Wiring Diagrams

By *LEROY CHADBOURNE*

In many projection rooms, especially at this time, complete schematic diagrams of the sound apparatus do not exist and cannot be obtained. This is a serious situation for the theatre. The present article continues a previous discussion[1] of how the projectionist can make his own schematic diagrams—a process in which making a wiring diagram is a desirable and almost indispensable preliminary.

THE wiring diagram of part of a volume control amplifier may be seen in Figure A and represents the under side of the shelf shown in Figure B. Figure 1 illustrates the first step in making this diagram from the actual apparatus and consists of sketching the component parts as nearly as possible in the exact positions they occupy in the equipment. The parts are shown as mere outlines. These outlines are roughly drawn the same size in comparison to each other, as the actual parts.

Figure 1 is a wiring layout and no effort is made to show the parts photographically. The tubes, for example, are represented only by the oval outlines of their sockets. Condensers are represented by circles or rectangles, and resistors by rectangles. Note especially the little circle at the right, at the bottom of the column of rectangles. This represents a grommeted hole in the chassis through which a pair of wires passes upward, through the shelf, to connect with a choke coil at the top. That coil is the device looking like a transformer, seen at the top right in Figure B. The little circle, when properly labeled "L-1," represents that choke coil with all the accuracy needed for a wiring drawing.

There are five steps to be taken in the making of a wiring diagram. Figure 1 represents the first step, and Figure 2 the second. Both figures are alike except that in Figure 2 connection terminals have been added to all the apparatus.

It may occur to the projectionist that these two steps might be combined; that he might add the terminals to each piece of apparatus in Figure 1 while sketching them. This is not a very good idea. The projectionist is drawing Figure 1 from the actual equipment, which he has open before him. His first task is to make sure he has every piece of apparatus in his sketch—that he has seven rectangles in that right-hand column, not six or eight. (In more complex amplifiers there might be thirteen rectangles instead of seven—or an even greater number—as will be seen in a future article.)

It is enough of a job to make sure that every piece of apparatus is included, that each one is drawn roughly in its right place, and of the approximate correct size proportionately to the others. Trying to do too many things at once only leads to confusion and mistakes. When the first step is finished, then proceed to the second step, which is converting Figure 1 into Figure 2.

Step by Step

With the completed Figure 1 in hand, take one symbol at a time, look for the corresponding part in the actual equipment and add the appropriate connection points to that one symbol, then proceed to the next symbol. When every connection point has been added, Figure 1 will have been entirely converted to Figure 2, and the second step in the process of making the wiring diagram will be finished.

The third step, which consists in adding the necessary apparatus information, is more intricate and much more difficult. For example, observe the left-hand socket in Figure A. Each prong is labeled. At top left is H-2, the number 2 heater prong. Proceeding around the socket counter-clockwise the next symbol is SU, the supressor grid prong; then comes SC, screen grid; P, plate; H, the other heater prong (which might also be designated H-1). Then follow SH, shield or shell (this is a metal tube), and C, the cathode. The grid—that is, the control grid—is at the center of the socket. Connection to this grid is not made at a socket prong, but through a grid clip at the top of the tube. Some draftsmen prefer to show the grid clip as a large bulge at the side of the socket.

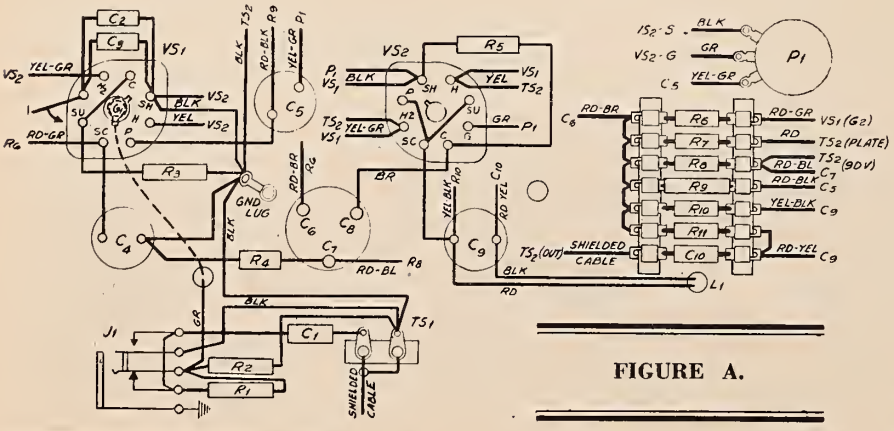


FIGURE A.

FIGURE B.

Now, if the projectionist is making a wiring drawing of his own equipment, he must obtain this kind of information about his sockets and add it to Figure 2. He also must obtain and add other types of information concerning his condensers, resistors, etc. Without this information his wiring drawing will be incomplete and he may have considerable trouble converting it into a schematic.

Step three in the process of making a wiring drawing consists not only of adding this information, but of collecting it so it can be added; and that may, according to circumstances, give the projectionist little or much trouble.

Apparatus Information

Sometimes all the information may be found right on the equipment, and in that case nothing more is needed than to copy it. For example, the socket markings shown in Figure A may be stamped or painted on the socket, and then again they may be completely omitted.

There are several sources of tube-and-socket data. Sometimes the socket diagram is shown on the box or wrapping

The LITTLE THEATRE "OFF BROADWAY"

A Signal Corps Photo

This is the caption which backed up this photo from the special service project at Camp M. Lyantey, Africa, another of those spots where movies are second in importance only to mail.

As long as movies mean so much to our fighting men, American exhibitors will never complain because they can't buy new equipment. Most of the Strong projection lamps they might have had are destined for use by our boys over there.

Anyway, Uncle Sam needs our dollars to finance this war and he needs them now! Not just the dollars we can spare, but every dollar that isn't absolutely needed for food, shelter and clothing. So put that money, which was earmarked for equipment, into War Bonds now. Don't stop until you've invested to the very limit.

THE WORLD'S LARGEST MANUFACTURERS OF PROJECTION ARC LAMPS

THE STRONG ELECTRIC CORPORATION • 87 CITY PARK AVE. • TOLEDO 2, OHIO

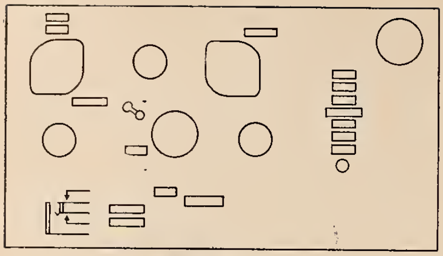


FIGURE 1.

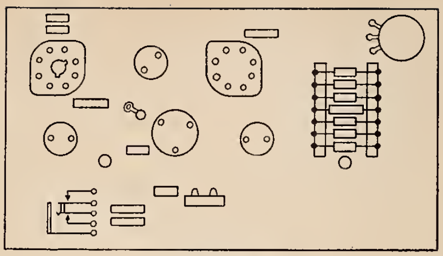


FIGURE 2.

in which new tubes reach the theater. Tube manufacturers also supply this information in the form of booklets which are sold for a few cents, or on charts that are furnished free of charge. All tubes of the same type number will have the same socket prong arrangement, regardless of who is the maker. (Western Electric tubes are an exception to this statement—they are typed according to a numbering system entirely independent of that used by other manufacturers.)

Figure 3 illustrates a small part of one manufacturer's tube chart and the socket connection chart may be seen in Figure 4. Let us consider the first tube listed in Figure 3, the 1A5G. Following across the top of the chart we find, third column from the right, the heading "Base Connection," and under that heading we find that the 1A5G has a type G-6X base. Referring to the base connection chart, Figure 4, we observe the G-6X type at the bottom of the ninth column. In practically all such charts the base (or socket) is drawn as seen from underneath. With this type of information the projectionist can readily add the correct data to the sockets of his wiring diagram, even if the sockets themselves are unmarked.

One other source of socket information is available to every projectionist: break open an old tube of the same type, and trace the prong connections to the various grids, plates, etc. An ohm meter will be found helpful but it is not indispensable. In checking an old tube remember that whatever other connections may or may not exist, there *must* be two heater contacts.

Tube socket data is only one of the necessary items of apparatus information. Before considering the others, however, it will be helpful to turn to the matter of identification numbers, already mentioned in a previous article (I. P., Aug. 1944). These numbers are R-1, R-2, C-5, C-8, and so on.

Identification Numbers

Identification numbers are purely arbitrary—any system of numbers can be used. If the apparatus parts have been numbered by the manufacturer, the projectionist merely copies those numbers onto his Figure A, and later recopies them onto his schematic diagram. Thus the same part will have the same number in the schematic, in the wiring diagram, and in the actual apparatus—a procedure which will be found to be of great help in repair work of any kind.

The projectionist, as a rule, will try to analyze the causes of trouble by looking at his schematics, tracing their circuits. That is what schematics are for. Having decided that, say, resistor R-6 may be responsible for some difficulty, the projectionist next looks at his wiring diagram (Figure A) to find out roughly where R-6 is located in the equipment. He then checks the appartus in that approximate location and finds the resistor marked R-6.

If the manufacturer has not marked the component parts of his apparatus with identification numbers, then the projectionist should give them his own numbers on his wiring diagram, Figure A. Having done this, he should then refer to his apparatus and mark the actual equipment to correspond; India ink may be used for this purpose. Parts that are too small to be marked (such as match-stick size resistors) and that are so mounted that they cannot be identified by marking the panel behind them—or parts that are too small to be marked without hiding their color-coding—can be identified by tying the smallest size price-tags to them. Mark the tag on both sides. Tags are clumsy, however, and tend to fill the apparatus with dangling bits of cardboard that catch dust and impede ventilation. Mark the part directly, or mark the chassis near it, if at all possible, and use the tags only as a last resort.

Tube sockets, like all other components, should be given identifying numbers—VT-1, VT-2, and so on.

There is a good deal of other apparatus information which is necessary if the completed schematic is to be of maximum use. The time to collect all this data is during the third and fourth steps in the process of making the wiring diagram.

Very good reasons exist for getting the data together at this particular point in the job. In the first place, it should always be gathered before any schematic is attempted. When Figure A is translated into a schematic drawing the projectionist will have to determine such questions as for example, which resistor in Figure A is a grid bias resistor and which is a plate load resistor, along with many other details of the same kind. Primarily the projectionist decides these points by tracing wires, but apparatus information helps push the work through much faster and at same time prevents mistakes. For instance, the projectionist knows (if he knows enough to do this work at all) that R-9, if it is 500,000 ohms, can't be a grid bias resistor; and R-4, if it is 5,000 ohms, is not likely to be the plate load.

A second reason for collecting this information during the third and fourth steps already outlined, is that sometimes wires may have to be disconnected to obtain the data. That is, it may be necessary to use an ohm meter on a resistor to find its value. But some wires may also have to be disconnected for the purpose of tracing them—the fourth step in making the wiring diagram. While it generally is unwise to try to do two things at once in this kind of work, it is also unwise to tamper with soldered connections any more than is absolutely necessary. Therefore, jobs that require unsoldering should, as an exception, be done at the same time.

The following apparatus data should be collected if possible: (1) resistor ohmage and wattage; (2) potentiometer and rheostat ohmage, wattage and taper;

TUBE TYPE	CLASSIFICATION BY CONSTRUCTION	TYPE CATHODE	FILAMENT SUPPLY	FILAMENT VOLTAGE	FILAMENT CURRENT	MAXIMUM PLATE VOLTAGE	MAXIMUM SCREEN VOLTAGE	RMS VOLTS PER PLATE	MAXIMUM DC OUTPUT MILLIAMPERES	PEAK CURRENT MILLIAMPERES	PEAK INVERSE VOLTS	GRID VOLTAGE	SCREEN VOLTAGE	SCREEN CURRENT	PLATE VOLTAGE	PLATE CURRENT	PLATE RESISTANCE (OHMS)	MUTUAL CONDUCTANCE	AMPLIFICATION FACTOR	LOAD FOR RATED OUTPUT (OHMS)	POWER OUTPUT WATTS	BASE CONNECTION	OUTLINE DRAWING	TUBE TYPE
1A5G	POWER AMPLIFIER PENTODE	FIL	DC	1.4	.05	90	90					4.5	90	.8	90	4.0	300,000	850	255	25,000	.115	G-6X	23	1A5G
1A7G	PENTAGRID CONVERTER	FIL	DC	1.4	.05	90	45	ANODE = 90V. IA = 1.2				0	45	.6	90	.55	600,000	CONVERSION CONDUCTANCE = 250				G-7Z	24	1A7G
1C5G	POWER AMPLIFIER PENTODE	FIL	DC	1.4	.10	90	90					7.5	90	1.6	90	7.5	115,000	1,550	160	8,000	.240	G-6X	23	1C5G
1C7G	PENTAGRID CONVERTER	FIL	DC	2.0	.12	180	67.5	ANODE=180V. THRU 20M OHMS IA=3.3				3.0	67.5	2.0e	180	1.5	750,000	CONVERSION CONDUCTANCE = 325				G-7Z	20	1C7G
								ANODE=135V. IA = 2.6				3.0	67.5	2.0e	135	1.3	550,000	CONVERSION CONDUCTANCE = 300						
1D5Gp	SUPER CONTROL RF PENTODE	FIL	DC	2.0	.06	180	67.5					3.0	67.5	.8	160	2.3	1,000,000e	750	750			G-5R	20	1D5Gp
1D7G	PENTAGRID CONVERTER	FIL	DC	2.0	.06	180	67.5	ANODE=180V. THRU 20M OHMS IA=2.3				3.0	67.5	2.4	180	1.3	500,000	CONVERSION CONDUCTANCE = 300				G-7Z	20	1D7G
								ANODE=135V. IA = 2.3				3.0	67.5	2.5	135	1.2	400,000	CONVERSION CONDUCTANCE = 275						
1E5Gp	RF AMPLIFIER PENTODE	FIL	DC	2.0	.06	160	67.5					3.0	67.5	.6	180	1.7	1,500,000	650	1,000*			G-5R	20	1E5Gp

FIGURE 3. *Essential technical data for types with octal bases.*

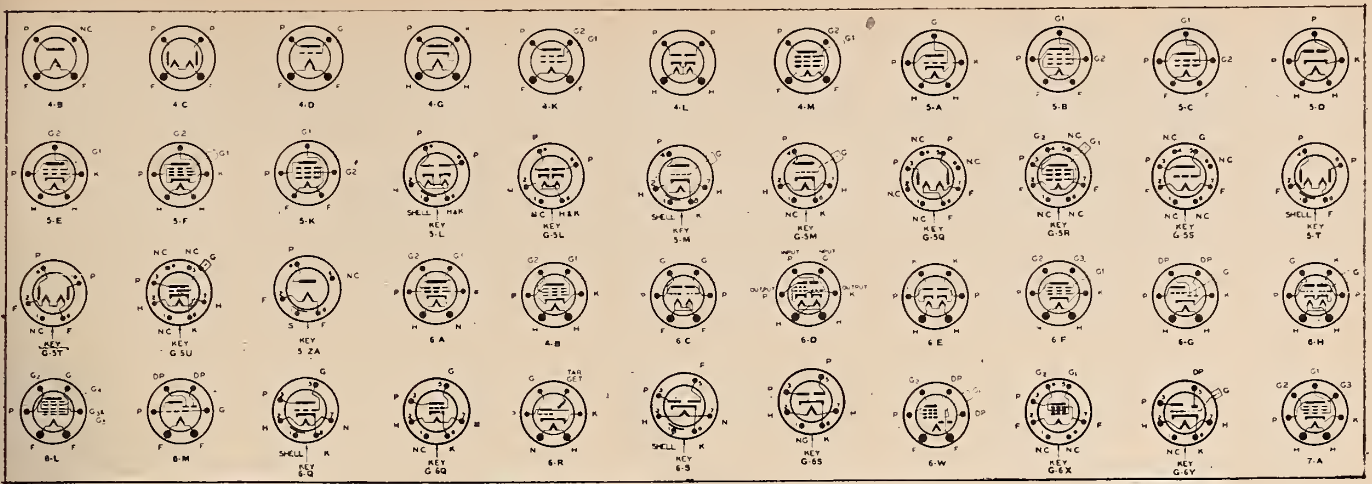


FIGURE 4. *Chart showing base connections.*

(3) condenser capacitance and voltage; (4) reactor inductance and current; (5) power transformer input and output voltages, and wattage; and (6) speech transformer impedances and ratio.

It will be noted that no such information is included in Figure A. Instead, it is found in the tabulation, Table 1, which is associated with Figure A. Such tabulations are generally placed at some corner of the drawing, where they cannot get lost or become mixed up with the tabulation for another diagram. And in this connection, it will be observed that the identification numbers perform a fourth service.

Some draftsmen place the information of Table 1 directly on the appropriate parts of the wiring and schematic diagrams. A professional draftsman can do that without cluttering up the diagram unduly, or making it too difficult to read. The projectionist, however, will be well advised to keep the data in a separate tabulation and add only identification numbers to his diagrams. In that way the information is just as available, and the diagram remains clearer and easier to follow.

TABLE 1.

DESIG.	PART NO.	APPARATUS
$C_{1-2-3}C_{10}$	SN-788	.01 MF - 500V CAP.
C_4, C_5	" - 514	.05 MF-400V "
C_6		8 MF - 250V "
C_7	" - 506	8 MF - 150 V "
C_8		10 MF - 50 V "
C_9	" - 1082	.25 MF - 200V "
R_{1-2}, R_9	SN - 539	500,000Ω - 1 WATT RES.
R_3	" - 1129	5,000Ω - " " WIRE W.
R_4	" - 1071	100,000Ω - ½ WATT "
R_5	" - 1130	2,000Ω - 1 WATT " WIRE W.
R_6	" - 537	2 MEG - ½ WATT "
R_7	" - 540	25,000Ω - " "
R_8	" - 688	50,000Ω - " "
R_{10-11}	" - 612	10,000Ω - " "
L_1	SN-1045	REACTOR 7 HENRIES
J_1	SN-1077	JACK
P_1	" - 1074	500,000Ω POTENTIOMETER
TS_1	" - 611	TERMINAL STRIP
VS_{1-2}	" - 561	SOCKET OCTAL
*VT_1	" - 792	VACUUM TUBE (TYPE 6J7, B-31)
*VT_2	" - 1066	" " " 6SJ7
AM-2074 TERMINAL STRIP (TS_2)		
C_{11}	SN-1086	.1 MF - 200V.
C_{12}		.1 MF - 200V
R_{12-13}	" - 539	500,000Ω - 1 WATT RES.
P_2	" - 1085	200,000Ω POTENTIOMETER

Sources of Data

There are four possible sources of resistor data. The apparatus may be completely stencilled by the manufacturer, and the ohmage rating may be shown by color coding. Then again the information may be contained in the manufacturer's instruction book, even in those cases where diagrams are not included. Or the resistor can be measured with an omh meter. For this last, at least one end of the resistor should be completely disconnected, to make certain the reading is not falsified by some unknown parallel circuit. The fact that only two wires run to a given resistor does not mean that there is no parallel circuit connected to those wires somewhere else in the equipment.

The ohm meter and the color code do not show the wattage rating of the resistor. Sometimes this information cannot be obtained. The color code, Table 2, applies to the products of all manufacturers, without exception.

Read these colors in the order, Body (B), End (E), and Dot (D), the letters spelling the word bed. The first color to read is that of the body of the resistor; next that of the end, and last, that of the dot added at the center of the resistor. Occasionally this dot is replaced by a band, and sometimes the whole resistor is not colored; there may be a color pattern at the center. This pattern will consist of a large area of color (body); a smaller area to one side (end) and a band in the center of the larger area (dot).

Now, the first two colors are translated directly into figures; the third color, however, represents the number of zeros that follow the first two figures. Thus, if the dot color is yellow, four zeros follow the first two figures indicated by the code.

If the colors have been obscured by dirt, try cleaning them with a *dry* rag. Depending on the dyestuff used, either water or carbon tet may possibly completely remove the colors, therefore do not resort to any cleaning fluid unless dry rubbing will not serve.

Condensers are sometimes color coded. The resistor code is used in the form of three small colored dots, with an arrow or other indicator showing the order in which the colors are to be read. The third color translates into the number of zeros following the first two figures, just as with resistors. The resultant reading is in micro-microfarads. To translate to microfarads, multiply by 1,000,000.

One other item of apparatus identification is of great practical importance, and that is the part manufacturer's code number, if there is one. Many parts that are not marked in any other way, will carry the part maker's name and code number. A rectifier, amplifier, or other sound component may be made of parts produced by many manufacturers. Where the part manufacturer's name and code number can be found, they should in every case be added to Table 1. This helps in ordering replacements. At the same time, that part manufacturer becomes one more source of electrical information, to whom the projectionist can apply (if all other sources fail him) for data on such points as condenser voltage, resistor wattage, etc.

Additional and useful details relating to the making of wiring diagrams will be presented in another article scheduled to appear in a future issue of I. P.

TABLE 2.
Resistor Color Code

Black	0	Brown	1
Red	2	Orange	3
Yellow	4	Green	5
Blue	6	Violet	7
Gray	8	White	9

Altec Service Corp. Stages Five-Day Conference on Post-War Problems

WITH headquarters at the Hollywood Roosevelt Hotel, Hollywood, Altec Service Corporation staged a five-day gathering of its personnel at which current and post-war prospects and problems were discussed. At the opening session addresses were made by G. L. Carrington, president; H. M. Bessey, vice-president; E. Z. Walters, comptroller; J. K. Hilliard, and Stanley Pariseau, Los Angeles district manager.

Richard F. Walsh, International president of the IATSE, at the initial session. expressed gratification for the spirit of cooperation that exists between the Altec organization field personnel and the men of the IATSE in projection rooms throughout the country. He also paid tribute to the men who have helped to keep the sound reproducing equipment of the theatres running on a quality basis during the war period.

Paramount Studios were visited on Oct. 16, where technical problems of production and exhibition were discussed. Next Paramount television studios and transmitters were visited, where the Altec group saw recent developments in television. In the evening Altec managers heard from company engineers and consultants on various aspects of television and sound developments which may influence future theatre operation.

Technical discussions continued during the second day of the meeting. A visit also was made to the MGM Studios.

A comparative demonstration of loudspeaker systems of various manufacturers was given at the Filmarte Theatre, Hollywood, under the direction of James B. Lansing, vice-president of the Altec Lansing Corporation. attended by those at the meeting, including district managers, branch managers. field supervisory engineers and technical advisors.

The requirements of post-war sound systems necessary to produce the high quality responsible to enable motion picture theatres to meet the standards to be set by post-war films was presented by John K. Hilliard, chief engineer of the Altec Lansing Corporation.

A visit also was made to the West Coast Laboratory of the Altec Service Corporation for inspection of various electronic apparatus developed for the motion picture industry. Technical discussions were held as to their proper application in the servicing of sound systems in the six thousand theatres serviced by Altec.

WAR STANDARDS ADOPTED IN PHOTOGRAPHIC FIELD

The American Standards Association has approved two new American war standards in the photographic field, photographic aperture of 35-mm motion picture cameras, and picture projection aperture of 35-mm motion picture projectors. Both are part of a series of war standards being developed at the request of the armed forces and WPB.

Both of the new standards are interrelated and are the result of long experience in industry as to the proper size of the image to be registered on film in professional motion picture cameras and the optimum part of the picture to be projected in motion picture theatres, taking account of the various variables introduced in the processing and projection of the film, such as film shrinkage, and camera, printer, and projector weave.

The standards were developed through Sub-committee H on 35-mm Cinematography of the ASA War Committee on Photography and Cinematography, Z52. This committee had the active cooperation of the SMPE and the Research Council of the Academy of Motion Picture Arts and Sciences in its work.

SOLDIERS ABROAD NOW "TELLING IT WITH PICTURES"

With the aid of the Army's film developing organization, set up by the Army Exchange Service, soldiers in the European war theatre are enabled to "tell it with pictures" to the folks back home. When pressure for film developing became so intense that the Army Signal Corps could not handle the job the Army's Special Services Division went to work on the problem, the result being that a corps of finishers was recruited and sent abroad to speed up the developing. It was all hrought ahout by the large numher of camera fans, new and old, in the Army. The boys are snapping away as they go along, and are using plenty of film.

LT. SAMSALIG DIES IN ACTION

First Lieut. Monroe Samsalig, who was shipping clerk for S.O.S. Cinema Supply Corps, has heen killed in action in France, according to a report of the War Department. Lieut. Samsalig was the first man to enter the service from S.O.S., having been called up in September, 1940. At that time he was a sergeant in the New York National Guard, 165th Infantry.

ALTEC EXECUTIVES, DISTRICT AND BRANCH MANAGERS, AND FIELD SUPERVISORS AT HOLLYWOOD MEETING

Top Row (left to right): W. E. Gregory, Seattle; F. C. Dickely, Detroit; H. W. Dodge, Los Angeles; R. W. Flygare, Salt Lake City; O. E. Maxwell, Minneapolis; E. B. Lee, Los Angeles; G. E. Wiltse, Dallas; H. S. Morris, New York; J. M. Ridge, Los Angeles; M. G. Thomas, Cincinnati; L. J. Patton, New York; A. J. Rademacher, New York; W. C. B. Evans, Los Angeles. Center Row: L. J. Hacking, Boston; W. Conner, Cincinnati; H. B. Moog, Atlanta; F. Fiore, Los Angeles; E. Z. Walters, New York, comptroller; A. A. Ward, Los Angeles, vice-president Altec Lansing; G. L. Carrington, president Altec Service, and Altec Lansing; H. M. Bessey, vice-president Altec Service; J. B. Lansing, Los Angeles, vice-president Altec Lansing; J. K. Hilliard, Los Angeles, chief engineer; B. Sanford, Jr., New York.

Bottom Row: R. Hilton, Chicago; D. A. Peterson, Philadelphia; C. J. Zern, Dallas; R. G. Gray, Chicago; C. S. Perkins, Lexington, Mass.; R. A. Quinn, Los Angeles; S. W. Hand, New York; J. A. Cameron, E. Maples, S. M. Pariseau, Los Angeles, staff representatives.

AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Locating Trouble in the PG-70 Sound System

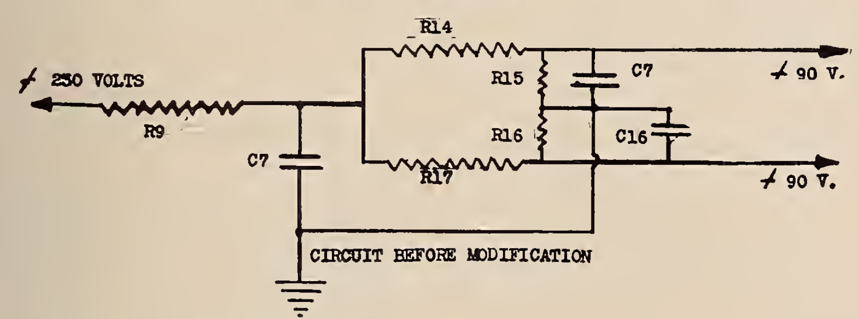
I recently ran across a situation in a PG-70 sound system where the sound failed when the set was turned on. At times is was only necessary to touch the grid cap on the 57-type tube or pass an object between the exciter lamp and the p.e.c. and the set would then become operative. I tried replacing coupling capacitors but this didn't help the situation. I finally checked the d.c. resistance of the various components in the amplifier and found that the cathode resistor in the output stage had various readings depending upon its temperature. Since replacing this resistor, the operation of the amplifier has been normal.—H. M. MORROW, *RCA.*

Conserving Rectifier Tubes

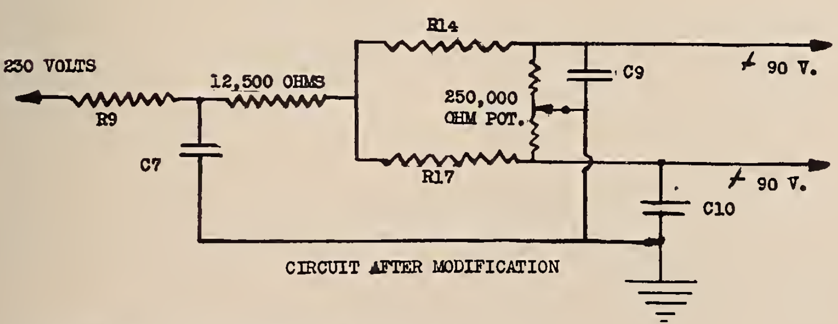
While removing a 6-ampere rectifier tube for socket cleaning, the glass envelope parted from the metal base. Electrically the tube was in good condition, so I used Permatix No. 1 to cement it together. Let it dry for a couple of days before using. Incidentally, an old pair of leather gloves is ideal for removing hot tubes.—M. RUSHWORTH, *RCA.*

Modification of Photo-Electric Cell Circuits in Motiograph M-11, M-12, and Similar Systems

Parts required for the modification of photo-electric cell circuits in Motiograph M-11, M-12, and similar systems for equalization by means of PEC voltage are one 250,000 ohm potentiometer and one 12,500 ohm one-half watt resistor. The procedure



CIRCUIT BEFORE MODIFICATION



CIRCUIT AFTER MODIFICATION

for modifying the PA-7466 amplifier is as follows:

Remove the two 100,000 ohm resistors R-15 and R-16. Connect the potentiometer in place of the resistors so the center of contact is connected with the junction of the resistors wires and the end of the contacts where the other ends of the resistors were. Install the 12,500 ohm resistor in place of the wire connecting the junction of R-14 and R-17 to one terminal of C7. See the accompanying diagrams.

The potentiometer can be mounted in the oval slot already in the amplifier chassis by means of two large washers. The shaft extends downward and this leaves the terminals very close to the connection points. Use the left-hand slot.—*RCA.*

Improvised Microphone

Small PM dynamic speakers can be used for microphones, and the quality is fairly good. Use the transformer mounted on the speaker to match the input impedance. Mount the speaker on springs to prevent noise.—J. A. DAY, *ALTEC.*

Striking Suprex Carbons

We have been told by some projectionists that occasionally difficulty is encountered in striking an arc when using up Suprex carbon stubs. To overcome the trouble they had been filing the crater end of the carbon until they were informed by the service inspector that simply wetting the finger tip and drawing it across the end of the carbon would accomplish the same result. This method has been tried several times and found very satisfactory.—J. E. TAGG, *ALTEC.*

Method for Removing Grease From 712-Pilot Shaft

An interesting item received from service inspector A. Jackson, of Vancouver, concerns the action taken in removing grease blockage in the oil passages of the 712-type drive pilot shaft. Mr. Jackson has found that the discarded main spring of a small watch can be forced into the oil channel and, due to the springiness and curvature of the metal the passages are soon clear of any obstruction.—*ALTEC.*

Correction for Slipping Remote Volume Control Clutch

Where a remote control assembly employs a clutch which slips and is not dependable, an application of resin on the clutch surface corrects this condition when usual procedures fail.—S. M. FALK, *RCA.*

Correcting Trouble in MI-1500 Relay

I recently ran across a situation where loss of exciter lamp voltage was traceable to the contacts on the Yaxley switch in the MI-1715 control box. When the relay was in the energized position, there wasn't enough voltage due to the resistance between the switch contacts to hold the relay contacts firmly together.

(*Continued on page* 27)

IN THE SPOTLIGHT

By **HARRY SHERMAN**

PERSONS who regard labor as a commodity similar to all other commodities do not take into consideration the many peculiarities that characterize the labor supply. It is granted that labor is like all other commodities in that the services of labor are bought and sold and command a price on the market, but to say that labor *resembles* a commodity is not the same as saying that it *is* a commodity.

It is worth noting the peculiar characteristics of the labor supply that differentiate it from the supply of marketable commodities. The labor that is bought and sold and the personality of the laborer are one. When an employer buys raw material to be used in the production of merchandise, he gains full ownership and control over it—he can dispose of it as he wishes. But when he purchases labor he does not gain ownership of the laborer, as did the master in the days of slavery, he merely bargains for the services of the laborer. These services, however, cannot be divorced from the worker. When a worker sells his services he does not give up ownership of himself, a fact that many employers either fail or do not wish to recognize.

● Gene Atkinson, the enterprising business agent of Local No. 110, Chicago, has initiated a new program for his members. It is Gene's contention, and rightfully so, that when pictures are shown at increased admission prices the projectionists should be paid according to the road show scale. He recently scored another victory over Chicago exhibitors who attempted to play "super colossal" pictures at road show prices without paying the road show salaries to the projectionists. Despite the usual shedding of crocodile tears by the exhibitors, Gene won his point and all Local 110 men working in theatres showing super-duper pictures at higher than normal prices receive road show salaries. Swell going, Gene.

Gene Atkinson

● A busy man indeed is our good friend, C. Fred Kelsick, secretary of Local No. 143, St. Louis, Mo. Fred is vice-president of the Missouri Central Trades and Labor Council and recently was apppointed the St. Louis agent for the Union Life Insurance Co. He is proud of this new affiliation and guarantees a square deal to all his clients.

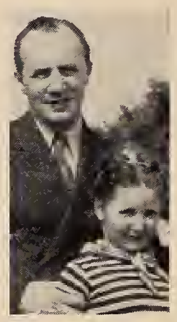
● We received an interesting letter from one of our readers, a member of one of the Pennsylvania local unions. He is very much concerned about the problems that are bound to confront the craft in the post-war days when our boys come home and take up civilian life. He is disturbed about the apparent apathy with which we view the possibility of being faced with very serious competition of thousands of army and navy projectionists when they are released from service. In the armed services today there are thousands of projectionists, men who never knew what a projection machine looked like before they entered military service. Many of them are today working with radar, radio, and television equipment and are familiar with things we at home dream about. A large percentage of these men plan to continue with projection work in civilian life.

He writes, "My brother, who was a projectionist prior to his enlistment in the Army Air Force, came home on furlough several weeks ago and he told me about an army private stationed at his air base, who was put to work repairing Bell & Howell 16-mm projection machines. This soldier was learning the trade of watch making when he was inducted, and his knack in handling delicate mechanisms made it easy for him to learn how to handle projection equipment. He now can take apart, clean, repair and put together any 16-mm machine, and his next step is the care and maintenance of 35-mm projectors. Do you think this man will go back to the trade of watch making upon his release from the army? I am quite sure he won't. He is only one of many who will turn to projection as a means of making a livelihood.

If our craft would only wake up and look ahead a year or two, or maybe less, and come to a realization of the stiff competition they will be faced with when these men resume civilian life, they will begin at once to prepare for the day when a man will need something more than an I. A. card to hold his job."

Anything we might add would be superfluous. We have expressed these sentiments time and time again and we are happy to know that there are others in this industry who are aware of this phase of post-war problems.

● Solly Pernick, business agent of Local No. 1, New York Stage Hands, was granted a leave of absence from his local union duties to tour the battlefronts with an USO unit of the hit show "Oklahoma." Pernick's last official act as business agent was the completion of negotiations calling for salary increases for road crew members. The heads of the road crew are to receive $130 a week while a show is playing in New York, with an additional $70 per week for traveling expenses when on tour. The assistants will receive $121 per week, plus $50 per week for expenses while on tour. The local stage hand heads will get $125 per week.



Solly Pernick and daughter

Congratulations to you, Solly, and to the I. A. office for putting over a swell deal.

● We were recently paid a visit by Fred Taylor, member of Local No. 233, Buffalo, N. Y. We had quite a gab-fest

and Taylor informed us that Edward Ostrowski, member of his local and son of the venerable Mike (one of the oldest members in Local 233 and a member of the 25-30 Club), is in charge of all 16-mm equipment and films at Camp Sampson, N. Y. Young Ostrowski takes his work very seriously and is doing a fine job.

● There are many ways of helping in the war effort. Not all men are able to serve in the combat areas and many men, for some reason or other, are not eligible for military duty. However, there are a number of ways in which we can help in the war effort and one organization in particular, the U. S. Coast Guard Reserves, offers opportunities to those men who, although they cannot serve on any of the battlefronts, want the satisfaction of knowing that they are doing their share here on the home front.


H. S. Morton

Among the many I. A. members serving with a USCGR unit is Houston S. Morton, chairman of the Educational Committee, Local No. 199, Detroit, Mich. Morton is a petty officer in the Coast Guard unit operating from the Detroit base and serves a minimum of 52 hours each month. He considers it a privilege and an honor to be a member of this group.

● Sam N. Bonansinga, business manager for the past 31 years of Local No. 138, Springfield, Ill., has been endorsed by the Springfield Federation of Labor, of which he is president, for the vice-presidency of the Illinois State Federation of Labor. Nine vice-presidents are to be elected at the State Federation convention next month, and we strongly urge the I. A. delegates to make every effort in Bonansinga's behalf. A brother unionist on the State Executive Board may be in a position to be of assistance to your local union, should the occasion arise. Every delegate must remember that the problems of this industry are best understood by our own men, and it would be to the best interests of our organization if it were represented on the State Executive Board by an I. A. man.


S. Bonansinga

Sam Bonansinga has the high regard and esteem of his fellow-members, who are campaigning for him. Come on, you Illinois delegates, and lend your support to a man who represents the highest type of unionism.

● ***Local No. 199, Detroit, Mich.—Personalities and Events.***

Many comments have been heard about the grand job Harry Brewer is doing as Grand Exalted Ruler of the Detroit Elks Club.

James W. Padfield has been acting business agent for Local B-179 for the last few months, taking the place of B-179's former business agent, John W. Krivo, who was killed in action overseas. Padfield is doing excellent work in organizing the neighborhood theatres and he expects to have all theatre employees in Detroit 100% unionized before long.

The Nightingale Club inaugurated the 1944-45 season with the election of new officers. Officers elected are Edgar Douville, *president;* Floyd Akins, *vice-president;* Michael Badarak, *treasurer;* John Colwell, Jr., *financial secretary;* Roy Thompson, *recording secretary,* and Owen Blough, *chairman of the bowling committee.* This club is a fraternal organization formed by the members of Local No. 199 many years ago. It is essentially a bowling club and its members compete in local bowling tournaments. They meet once a month and usually wind up the bowling season with a dinner-dance. The club is non-profit and non-political—good fellowship, athletic and social activities form the basis for the club's existence.


Edgar Douville

A. (Abe) N. Feldstein may have been down for the count of nine but he was not out. Despite a severe illness which left him partially paralyzed and unable to continue with his work, Abe refused to take the count and was determined to lick the malady that felled him. After chasing all over the country trying various cures, he wound up in his own back yard—Mt. Clemens, Mich., where he took a prescribed number of treatments and today is back at his old job at the United Artists Theatre feeling fit as a fiddle.

● Our old friend, Frank E. Morrison, Local No. 225, Atlanta, Ga., is high in his praise of the good work being done for service men by the Fulton and DeKalb Country Masonic Association in Atlanta. This association opened a service club for GI's in the basement of the Masonic Temple and has provided accommodations for over 10,000 service men during the one year of its existence. It is supported by donations received from various lodges in the city, including the Atlanta Masonic Club of which Morrison is second vice-president.


F. E. Morrison

Incidentally, Frank is a Past Master of the E. A. Minor Lodge, No. 603, and we suspect that he takes much more than just a passive interest in the affairs of the serviceman's club.

● Wm. O. Strome, Jr., Local No. 514, Bellefontaine, Ohio, is strutting about these days like a proud peacock. He recently became the father of twins—a boy and a girl.

● The membership of the Associated Electronic Engineers is now represented in 106 I. A. local unions. Through the efforts of the I. A. office, this organiza-

(*Continued on page* 28)

Three generations of one family represented on the membership rolls of Local No. 306, New York. Left to right, Cecil R. Wood, Sr., Cecil R. Wood, Jr., and grandson Walter Wood, the latter a lieutenant in the U. S. Army and attached to the Signal Corps. Wood, Sr. is well-known in projection circles throughout the country and is one of the pioneers in this industry.

Frank Discusses Developments in Television Before the 25-30 Club

At the Oct. 27 meeting of the 25-30 Club in New York City, James Frank, Jr., discussed developments in television. Mr. Frank is the author of a series of articles which appeared in I. P. entitled "Television Today." Herewith are excerpts from his address.

ONE of the most important problems in connection with television today is the controversy over standards. It will be recalled that not many years ago new standards were recommended and adopted, which among other things, changed the number of scanning lines from 441 to 525. At that time a channel of 6 megocycles in width was recommended. On this basis, the Federal Communications Commission set aside 18 channels in the 50 to 108 megocycle portion of the frequency spectrum.

Some months ago, as a result of the development of vacuum tubes during the war effort, it was found that there might be great advantages in using a higher portion of the frequency spectrum for television, namely 400 to 1,000 megocycles. In so doing provision could be made for 35 channels of 16 megocycle width each. The wider channels were desirable particularly for color television. Obviously the greater number of channels was most desirable.

CBS seems to be the leading exponent of recommending that the commercial introduction of television be delayed until it was sufficiently perfected to make use of the higher frequency. RCA, Dumont and others have larger investments in television and recommend prompt introduction after the war in the present frequency band, with the thought that when the engineers have perfected the equipment for the higher frequencies, which may be anywhere from six months to ten years, and more likely five years, a gradual transition can take place. Hearings are now being conducted by the Federal Communications Commission in Washington to settle this controversy.

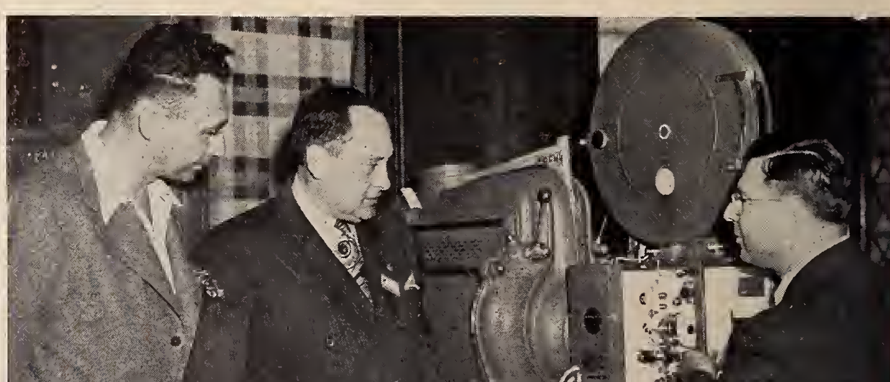
Projectionists are, of course, interested in the future of television, not only in the theatre, but also in the home. They are interested in television in the home not only because it will affect them as individuals, but also because they are concerned about the effect that television in the home may have at the theatre. There seems to be little doubt about the desire for larger images on home television receivers, approximately 24″ in width, as compared to 12″ prior to the war. It would seem that after television has been introduced into the home on a broad basis, that it might have some effect on theatre attendance, similar to that caused by radio. Presumably, it will not last too long.

It would seem that there may be considerable use of film in the production of television programs, but I believe on a basis which will not in any way compete with professional films in theatres. I foresee the possibility of vast use of 16-mm reversible film in connection with television programs. The motion picture industry has too large an investment to permit the television industry to unduly affect it. I believe that the commercial problems related to theatre television are more difficult to solve than the technical ones. At least three different manufacturers successfully demonstrated large screen television before the war, and with the improvements that unquestionably are being made as a result of the war effort, it should be entirely practical to provide such an equipment in the post-war period.

How to solve the problem of furnishing suitable television entertainment in the theatre is something else. It would seem probable that theatres will be linked by coaxial cable networks to prevent home receivers from listening-in on the program. The use of exclusive frequencies for radio network might be possible, but would not seem too practical.

Color television is receiving much attention, particularly from CBS, but apparently has not yet reached the stage where it is ready for commercial introduction in the early post-war period.

I believe that projectionists can look forward to television in the home and television in the theatre in the post-war period on a basis which should not unduly affect theatre attendance adversely. The solution of commercial problems of theatre television is a difficult and complicated task, however, and must be completed before it will be possible to induce theatre owners to invest large sums of money in theatre television equipment.



NEW DEVRY 35-MM PROJECTOR UNWRAPPED

H. B. Engel, sales manager of DeVry Corporation points out refinements in new war-born DeVry 35-mm projector to Nat Golden (center), chief of the motion picture division of the U. S. Department of Commerce, at the recent Theatre Equipment Dealers' convention. President W. C. DeVry is shown at the left.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Projectionists' Course on Basic Radio and Television

By *M. BERINSKY, E. E.*

MEMBER OF INSTITUTE OF RADIO ENGINEERS

V.—SERIES-PARALLEL CIRCUITS and MAGNETISM

As an added service to our readers, the author will be glad to answer all questions on electricity, radio, sound, and television. Questions pertaining to specific equipment should contain the name and model number. Address all communications to this magazine.

IN THE preceding installment of this series the parallel circuit was carefully considered from a mathematical and practical angle. Occasionally a circuit in radio or electrical work may consist of groups of parallel resistance in series with other resistances. Such a connection is known as a series-parallel circuit. The solution of such a circuit is somewhat more complex than a simple parallel connection of resistance. Let us consider a solution of series-parallel circuits before proceeding with the more important topic of magnetism.

When series-parallel circuits occur the usual procedure of solution is first to replace each group of parallel resistances by its equivalent single resistance, and then treat the entire circuit as a series circuit. An example of a series-parallel circuit is shown in Figure 1. This circuit consists of a single resistance of 5 ohms, a parallel branch of two resistors of 10 and 12 ohms, and another parallel branch of three resistors of 15, 20, and 25 ohms. These three branches are connected in series. The usual procedure of solution is as follows:

1. *Find the resistance of each branch.*
2. *Find the total resistance of the circuit.*
3. *Find the total circuit current.*
4. *Find the voltage drops across the individual branches.*
5. *Find the current through each resistor.*
6. *Find the power taken by each resistor.*

For example—referring to Figure 1 we note that the resistance of branch *a*, *b* is 5 ohms, and the resistance of branch *b*, *c* consists of the parallel circuit of 10 and 12 ohms. The resistance of branch *b*, *c* is given by the formula $R_t = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{10 \times 12}{10 + 12} = 5.45$ ohms. The resistance of branch *c*, *d* is given by the formula $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$. We get $\frac{1}{R_t} = \frac{1}{15} + \frac{1}{20} + \frac{1}{25} = 0.0667 + 0.05 + 0.04 = 0.1567$.

To find R_t we invert both sides of the equation. Thus $R_t = \frac{1}{0.1567} = 6.38$ ohms. The total circuit resistance is equal to the sum of the equivalent branch resistances. $R_t = R_{ab} + R_{bc} + R_{cd} = 5 + 5.45 + 6.38 = 16.83$ ohms.

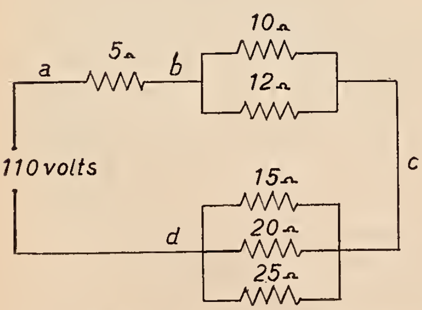


FIGURE 1. *A series-parallel circuit.*

Total Circuit Current

The third step calls for the total circuit current. This is found by dividing the line voltage by the total circuit resistance. $I_t = \frac{E_t}{R_t} = \frac{110}{16.83} = 6.54$ amps.

The voltage drops called for in step four are found by multiplying the total line current by the equivalent resistances of the branches. $E_{ab} = 6.54 \times 5 = 32.7$ volts; $E_{bc} = 6.54 \times 5.45 = 35.6$ volts; $E_{cd} = 6.54 \times 6.38 = 41.7$ volts. If our calculations are correct these voltage drops should add up to 110 volts, since in a series-parallel circuit the line voltage is equal to the sum of the branch voltages.

Step five calls for the current through each resistor. The current through the 5-ohm resistor will be equal to the line current, which is 6.54 amperes. This same current will flow through branch *b*, *c* but it will divide between the 10- and 12-ohm resistors, causing different currents to flow through each resistor. The amount of current through each resistor can be found by the application of Ohm's Law.

The current flowing through the 10-ohm resistor is equal to the voltage across the 10-ohm resistor (E_{bc}) divided by 10 ohms. For example, $I_{10} = \frac{35.6}{10} = 3.56$ amperes. The current through the 12-ohm resistor is found in a similar manner: $I_{12} = \frac{35.6}{12} = 2.97$ amperes. The sum of these currents should equal 6.54 amperes, the total current flowing through the branch.

When checking calculations you may not obtain an exact answer, as, for example, in the check just made. Here we find that the sum of I_{10} and I_{12} equals 6.53 and not 6.54 amperes. Answers do not always check exactly because a decimal point is dropped now and then. However, if the check is reasonably close the calculations most likely will be found to be correct.

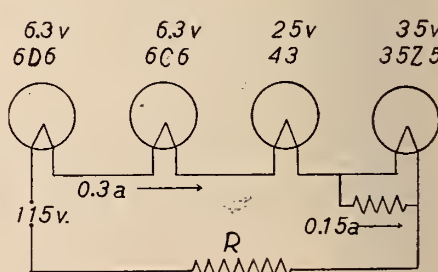


FIGURE 2. ***Four tubes connected in series. A resistor tube is required across the 35Z5 tube because it draws .15 amps. and all other tubes take 3 amps.***

The current through branch c, d is 6.54 amperes but this current divides into three paths. Each resistor in this branch will have a different current running through it. The current through the 15-ohm resistor will be equal to the voltage across it (E_{cd}) divided by 15, or $I_{15} = \frac{41.7}{15} = 2.78$ amperes, the current through the 20-ohm resistor is $I_{20} = \frac{41.7}{20} = 2.09$ amperes, and the current through the 25-ohm resistor equals $I_{25} = \frac{41.7}{25} = 1.67$ amperes. A check at this point will show that 2.78 + 2.09 + 1.67 equals 6.54, which is the total current through branch c, d.

Power Taken by Resistors

The power taken by each resistor can be found by any one of the formulae for power given in previous articles. The least difficult of these formulas is $P = E \times I$. The power taken by the 5-ohm resistor in branch a, b is equal to the voltage across it multiplied by the current through it, or $P_5 = 32.7 \times 6.54 = 214$ watts. The current through the 10-ohm resistor is 3.56 amperes. This figure must be multiplied by the voltage across the 10-ohm resistor (E_{bc}) in order to find the power taken by this resistor. We find that $P_{10} = 35.6 \times 3.56 = 126.8$ watts; $P_{12} = 35.6 \times 2.97 = 105.8$ watts. Also, the power taken by the 15-ohm resistor is equal to the voltage across it (E_{cd}) times the current through it, or $P_{15} = 41.7 \times 2.78 = 116$ watts; $P_{20} = 41.7 \times 2.09 = 87.2$ watts, and $P_{25} = 41.7 \times 1.67 = 69.6$ watts. From the examples just cited it may be seen that the solution of a series-parallel circuit is not unlike that of an ordinary parallel circuit.

A special solution of a series-parallel is sometimes required in radio work. Figure 2 shows a series-parallel circuit of an a.c.-d.c. filament connection. Normally a 25Z5 tube will be used in place of the 35Z5 tube shown in the diagram. A 25Z5 draws a filament current of .3 amperes. Since all of the other tubes shown also draw .3 amperes, use of a 25Z5 would result in a simple series circuit, and the original circuit would have used this tube. Because of the war, however, it is extremely difficult to obtain the 25Z5 at the present time. When this tube wears out the radio serviceman often is called upon to rewire the receiver so that another and more readily obtainable tube may be used.

Let us assume that it is desirable to rewire the radio so that it can use a 35Z5 tube in place of the 25Z5. A 35Z5 draws only .15 amperes while all other tubes take .3 amperes. In re-designing the receiver we assume that all the tubes draw .3 amperes and make our calculations accordingly. Under this assumption the 35Z5 will draw .15 amperes too many. In order to protect the 35Z5 from excessive filament current we shunt it with a resistor that will consume the additional .15 amperes.

The first unknown quantity is the value of the line dropping resistor and this value should be found before calculating the shunting resistor. The total voltage required by the set of tubes is the sum of 6.3, 6.3, 25, and 35, which equals 72.6 volts. Since the line voltage is given as 115v. it will be necessary to drop the excessive voltage across the line dropping resistor R. The amount to be dropped will be the difference between 115 and 72.6, or 42.4 volts. The resistance of R is the voltage across R divided by the current through R.

Since most of the tubes take .3 amperes,* we will assume that the 35Z5 also takes the same filament current. The resistance of R will then be E/I which gives us 42.4/.3, or 141 ohms. We should remember that we assumed the 35Z5 drew .3 amperes when we know that it was designed for not more than .15 amperes. Under such conditions the 35Z5 would receive too much current and its life would be reduced.

Reference to Figure 2 will show that a resistor has been placed across the filaments of the 35Z5. This resistor should be of such a value as to draw the excessive current of .15 amperes away from the filaments of the 35Z5. The value of this resistor can be easily calculated by the use of Ohm's Law. The voltage drop across the 35Z5 is 35 volts and the resistor is to draw .15 amperes. The value of the resistor is given by E/I which is 35/.15 and equals 233 ohms.

* *RCA Tube* Manual.

OCTOBER QUESTIONS AND CORRECT ANSWERS

1. (Q.) Four 64-ohm resistors are connected in parallel. Find the total resistance. *(A.) 16 ohms.*

2. (Q.) Three resistors of 10 ohms, 20 ohms, and 50 ohms each are connected in parallel across a 100-volt source. Find the total resistance of the circuit. *(A.) 5.88 ohms.*

(a) Find the current through each resistance. *(A.)* $I_{10} = 10$ *amps,* $I_{20} = 5$ *amps,* $I_{50} = 2$ *amps.*

(b) Find the total current of the circuit. *(A.)* $I_t = 17$ *amps.*

(c) Find the power taken by each resistor. *(A.)* $P_{10} = 1{,}000$ *watts,* $P_{20} = 500$ *watts,* $P_{50} = 200$ *watts.*

(d) Find the total power of the circuit. *(A.)* $P_t = 1{,}700$ *watts.*

The wattage rating of this resistor is given by the formula $P = E \times I$. In our problem E is equal to 35 volts and I equals .15 amperes. The power will be $35 \times .15$, which gives us 5.25 watts.

Magnetic Materials

Magnetic phenomena were noted by the ancient peoples. Certain stones, notably at Magnesia in Asia Minor, were found to have the property of attracting bits of iron, and they were given the name "magnets" because of the locality in which they were found. These stones also had other properties. It was found that when they were freely suspended they had the property of pointing north and south. This phenomena (the Chinese are generally credited with its discovery) was not discovered until the tenth or twelfth century. The practical use of such a stone in navigation gave it the name "lodestone," or leading stone.

Natural magnets are composed of an iron ore known in metallurgy as magnetite, an iron oxide having the chemical composition Fe_3O_4. When iron filings are brought in contact with lodestone, they concentrate at two or more regions, showing that the stone possesses two or more localized magnetic regions or poles.

Magnets and magnetism are involved in the operation of practically all types of electrical and radio apparatus. An understanding of magnetism is essential to the clear conception of the operation of such apparatus. Magnets may be divided into two general classifications, (1) *permanent magnets*, which have the property of retaining their magnetism over very long periods of time and which do not require any source of power to maintain a magnetic field, and (2) *electromagnets*, the magnetism of which depends on the magnetic action of electric currents.

Iron or steel is superior magnetically to any other single substance. Cobalt and nickel individually possesses magnetic properties which are greatly inferior to those of iron. Recently developed are alloys of iron, nickel, cobalt and other metals, such as aluminum, for example, which has excellent magnetic properties. Also, certain iron-nickel alloys have unusual magnetic properties. Permalloy, an alloy composed of 80% nickel and 20% iron is highly regarded. Hipernick, Coupernick, and Perminvar, a nickel-iron-cobalt alloy, are very common magnetic materials.

Perhaps the most common permanent magnetic substance used in radio work is a recent General Electric development called "alnico." This is an excellent magnetic material and is an alloy of iron-aluminum-nickel-cobalt. Alnico is very commonly used in permanent magnet dynamic speakers. These magnets are

replacing the old fashioned electromagnetic fields which require a source of current. Permanent magnet dynamic speakers are used in all small portable radio equipment as well as in most automobile radios.

The substances just mentioned, possessing magnetic properties, are called paramagnetic substances. On the other hand, most other substances tend to be less magnetic than a vacuum, although the magnetic effect usually is so slight that it is very difficult to detect it. Such substances are called diamagnetic. Bismuth is the most highly diamagnetic substance known.

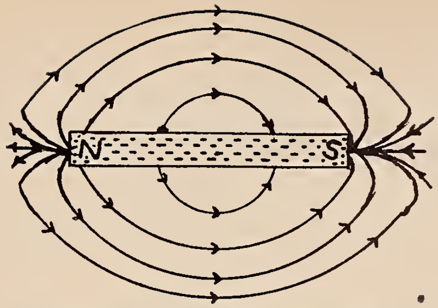


FIGURE 3. ***Magnetic lines of force around a bar magnet. Note the direction of the field (out of the north pole and into the south pole).***

Permanent (Artificial) Magnets

If a piece of hardened steel be magnetized, either by coming in contact with another magnet, or by means of an electric current, the steel will be found to have acquired a considerable amount of magnetism, whch it will retain indefinitely. Such a steel magnet is called a permanent magnet. If a piece of soft steel or soft iron be similarly treated, it retains only a very small portion of the magnetism initially imparted to it. These properties make it desirable to use hardened steel or its alloys when a permanent magnet is desired, and to use soft iron or soft steel when it is essential that the magnetism respond closely to changes in the magnetic force.

When a piece of iron, steel, or other magnetic body becomes magnetized, magnetism seems to emerge from the body in some regions and appears to enter the body in other regions. These regions where the magnetism seems to enter or emerge are called the poles of the magnet, and the strength of the magnet appears to be concentrated at these poles.

If a magnet is suspended freely it tends to assume a position which corresponds roughly with that of the geographic poles of the earth. The pole of the magnet which points to the North Pole of the earth is called the north-seeking pole, or simply the north pole. This pole usually is designated by the letter *N*. The other end of the magnet will, of course, point to the South Pole of the earth and is called the south pole of the magnet. This pole is designated by the letter *S*. The poles of a bar magnet usually appear at the ends of the bar. If the magnet is magnetized in the usual manner the north pole will appear at one end and the south pole will be found at the opposite end. The poles of a closed ring usually appear at the sides, one side being the north pole and the other side the south pole.

The magnetism of a magnet is assumed to exist around the magnet in many tiny lines of magnetic force. These lines are invisible but we know definitely that they exist; they are concentrated at the poles of the magnet and it is for this reason that we say that the strength of a bar magnet is also concentrated at the poles.

A magnetic pole may be defined as any surface from which magnetic lines are emerging or into which magnetic lines are entering. The lines of magnetic force are said to travel out of the north pole and into the south pole. The lines of force constitute what we call a magnetic field. Any piece of iron or other magnetic materials will be acted upon when in the vicinity of a magnetic field. In Figure 3 can be seen a bar magnet with north and south poles, and the direction of the lines of force.

NOVEMBER QUESTIONS

1. A parallel branch of 40 and 60 ohms is connected in series with another parallel branch of 10, 20, and 50 ohms. Find the total resistance of the circuit.

2. If the line voltage is 1,000 volts, find the total line current.

3. Find the voltage across the 40-60 ohm branch.

4. Find the voltage across the 10-20-50 ohm branch.

The correct answers to these questions will appear in the next issue.

"SLIMLINE" FLUORESCENTS AID THEATRE LIGHTING

Announcement of a new series of hot cathode fluorescent lamps, known as the G-E "Slimline," is good news for theatre owners, according to J. W. Servies, of National Theatre Supply, sales promotion department. This line is longer—up to 96 inches—and more slender—¾ and 1 inch—than previous tubes on the market. The tubes, according to Mr. Servies, start instantaneously and will be very popular in a multitude of lighting purposes in the motion picture field. General Electric Company states that interior cove lighting problems now can be solved by using these standard replaceable "Slimline" lamps instead of having to install custom made continuous tubing as a light source.

WPB APPROVES BONUS PAYMENTS

Customary Christmas or year-end bonuses may be paid to employees by corporations without asking permission of the War Labor Board, that agency announced this month.

REPRESENTING NATIONAL-SIMPLEX BLUDWORTH AT THE RECENT SMPE DINNER DANCE

Left to right:* *Miss D. Goldman; A. J. Palmer, executive vice-president; Earle G. Hines, president; John F. Campbell, plant manager; P. A. McGuire, director of public relations; Arthur E. Meyer, manager of projection equipment division; E. L. Worfolk, controller, and W. H. Taylor, legal department.

Presenting: Charles D. Peck

CHARLES D. PECK may be the original of the man who is "down but never out," for he has had plenty of ups and downs in his career, now happily on the "up" side. Mr. Peck, who was born in Chicago on April 16, 1892, originally became a member of Local 190 in Wichita, Kan., and later on, with some others, organized Local 414, of which he is secretary.

During his early infancy his parents moved to Los Angeles, long before the glamour of Hollywood, and during his youth he made many trips to and from Wichita, where his mother's folks lived. There was always a stopover in Minneapolis, and it was during one of these stopovers that Charlie saw his first movie show. It was across the street from the station, circa 1900, and it injected the bug into his system that has been predominant in his career ever since.

It was when Peck was about twelve years old that his family moved to Wichita where, with a few exceptions, he has been located ever since. The beginning of the Wichita era found Peck in an interlude in which "magic lanterns and graphophones" played the predominant part in his existence. He was a bug on the subject all through his school years, and still in his fifteenth year he began his apprenticeship in show business, after having spent some time hanging around the nickelodeons.

He actually started his first regular theatre job in 1907, after "stooging" around the nickelodeons a couple of years. He ran the back end of a Hales Tours car evenings at an amusement park, going to school in the daytime. Later on, in 1910, Peck began what he describes as his "double life," which he has more or less continued to date. The double life consisted at the time in sticking to his projection work and selling theatre equipment and supplies in the other hours during which he wasn't sleeping.

In 1910 he started working around the Olson Bros. place in Wichita. This was a combination booking office for vaudeville, a film exchange and an equipment supply house. In those leaner days than now he did many things, among them the opening of several hundred nickelodeons in the Wichita territory. He also installed municipal electric light plants (some as large as 50-kw capacity). He also worked one season as an electrician with a carnival. This job included the operation of a blacktop (pics), a belle show—sort of a variety show—a general helper around the entire plant, and he put up the fronts and took them down, and rolled up the wire. Lastly, he helped put the equipment in the cars. He also worked on road shows as an electrician, stage hand, and sold theatre supplies and equipment. Until 1917 it actually was a case of hopping around from one job to another, on the go all the time.

In 1917 Peck joined up with Uncle Sam, but there was no respite from the movies. He was assigned to the Y.M.C.A. to operate the projector at his flying field in Waco, Tex.

According to Peck he really settled down late in 1918. After being discharged from the service he worked at Muscle Shoals for a month or so as an electrician, and when a "de luxer" was opened in Wichita, the first in town, he was billed as "chief projectionist," holding the spot for four years, which is a long time in the effervescent life of Charles D. Peck.

The theatre folded in 1922, and Peck opened up a supply store of his own in Wichita, the fortunes of which were not outstanding, so he became a salesman for A. G. Smith, manager of the Southern Theatre Equipment Co., in the Oklahoma City store. Later he was made manager of the New Orleans district, remaining there for a couple of years.

Peck, beginning in 1926, when he reopened his business in Wichita, worked himself from zero to being the possessor of about $75,000 two years later. But 12 months later, in the fateful 1929 year, he again returned to zero, along with millions of others. Later on he opened his present business in Wichita, the Southwest Theatre Equipment Co., independent, at the same time doing projection work during the night hours, being connected with the Fox Theatres. He puts in a few matinees, too, by the way.

In the fall of 1945 he will have completed forty years in the business, and he has some idea of dropping his projection work at that time. It has been an active and happy life, and Peck's only regret is that circumstances did not permit him to join the boys taking pictures "over there."

HUBBELL JOINS CROSLEY CORP. IN IMPORTANT POST

Richard W. Hubbell, a 29-year-old native of Mt. Vernon, N. Y., the author of several books on television, has become broadcasting production manager for the Crosley Corporation, James D. Shouse, vice-president in charge of broadcasting, announced. Best known of Mr. Hubbell's books is "4,000 Years of Television." His appointment is a step in the Crosley organization's plans to resume experimental television broadcasts, which were interrupted by the war.

Crosley, it is learned, may erect a television tower in Kentucky that would provide television coverage for metropolitan Cincinnati, and is revamping television apparatus in the Carew Tower for possible resumption of broadcasts about Jan. 1.

Mr. Shouse believes television has a brighter post-war future than FM. He stated that "it is my opinion, and not necessarily an opinion shared by our manufacturing division, that television may be expected to develop much more rapidly than was generally thought until a few months ago."

Still another indication of the return to television experiments by Crosley is the shift of J. R. Duncan, engineer in charge of television, and his staff, back to television from the manufacturing division, where they had been moved to war work.

Local No. 110, Chicago, presents ambulance plane to the U. S. Army Air Forces.

SOLDERING PROJ. ROOM

(*Continued from page* 8)

soldering iron with the other, and trying to manipulate a string of solder with an odd finger or so, makes for clumsy work. This method can be used effectively only when the iron is used to pick up a bead of solder and deposit it at the point of contact.

Second and more important: while the solder is in the process of cooling, and is still passing through the semi-liquid, pasty stage, one of the parts that you are holding may slip a slight fraction of an inch. That may be enough to destroy the perfection of the soldered contact. Slippage is particularly likely to occur at this time because just about then the heat being conducted away from the point of soldering is likely to make the wires you are holding grow pretty hot. You may be tempted to let go a fraction of a second sooner than you should—remember that when the joint looks cold on the outside it is probably still in the soft pasty stage underneath, and therefore the wires should be held immovably a little longer than the surface appearance of the connection indicates.

The Flux

If you were up in the Arctic and wanted to fasten two boards together and had no nails you might soak both boards in water, bring them together and place them outdoors. They would freeze together.

Soldering is not exactly like that but the above may do as a very rough comparison and explanation. The important point to remember is that just as the water must soak *into* the boards if the joint is to have any firmness, so the molten solder must soak *into* the wires (dissolve into them, to be more accurate) or the soldered connection will be a mere surface contact of no value at all.

Now if those two boards up in the Arctic are coated with grease, water will not soak into them, and you would not be able to freeze them together very effectively.

Similarly the molten solder will not soak into the metals to be soldered if those metals are coated with products of chemical corrosion. Some metals won't corrode. Solder won't, generally speaking. Consequently many lugs and other parts, and some wire, are prepared ready for soldering by coating them in the factory with non-corrosive surfaces. Such parts and wire are said to be pretinned.

When you are not dealing with pretinned surfaces you must tin the surfaces yourself. This can be done in the act of soldering, but it is generally better

and more satisfactory, if time allows, to tin the two surfaces separately first, and then bring them together and solder them together.

To tin a surface for soldering, first clean off all physical dirt, adhering insulation, or grease of insulation, etc., by scraping. Scrape the metal, wire or what-not, bright and *shiny*. Any remaining spot on it that is not so scraped is a spot where solder will not hold.

However, solder may not hold on the spotless, shiny metal. You may have scraped it so deep that all surface chemical corrosion is scraped away, but a new, imperceptibly thin layer forms instantly, and increases in thickness very rapidly under the heat of soldering, or tinning. To remove this layer of chemical corrosion, chemical means must be used—nothing else will do.

The corrosive layer may be the oxide of the metal, or its carbonate, or in industrial atmospheres a sulphide, or all three—in every case an acid is the chemical agent needed to dissolve it. Hence, soldering can be effected with simple muriatic acid. Roofers and some plumbers use muriatic acid. But it is too corrosive to be trusted around electrical connections at any time. Other agents, such as sal ammoniac (ammonium chloride) which are acidic in their chemical reactions, are also used—and also are too corrosive for electrical work, especially for the delicate type of electrical circuits. In some heavy power work they are acceptable. Then there are various soldering pastes, warranted to be non-corrosive—some of them probably are. The safest flux to use in the projection room is rosin.

Advantages of Rosin

Rosin has the advantage of not being a powerful acid, although its effectiveness increases at the temperature of soldering. Cold, it is not active enough as an acid to have any serious corrosive effects at all. Rosin is undesirable to the plumber and the roofer, partly because of its expense and partly because its use requires too much scraping clean; it won't cut through many kinds of dirt, as the stronger acids do. In the projection room, scrape wires shiny clean and use rosin only. It is most effectively applied in the form of rosin-core solder. This is a tube of solder, the interior of which is filled with rosin powder.

The use of rosin, however, has the disadvantage of possibly creating a rosin joint. That is, a type of "cold joint" so cold that the molten solder cannot sink through the layer of molten rosin —normally the rosin melts first but the solder, melting afterward, evaporates it, and forces it out of the way, and penetrates it. A type of cold joint with a rosin layer surrounding the metals to be soldered is not even a physical connection between metal and metal, much less a soldered connection. It is likely to prove a non-conductor, because of the insulating properties of cold rosin. Or it may under some voltages be a partial conductor, very noisy in a sound system as the electricity forces its way through, melts a little rosin in doing so, and the molten rosin then flows into the conducting path, insulating it again, and so on.

To avoid any chance of a rosin joint, hold the soldering iron on the connection perhaps half a second longer than may

seem absolutely necessary. If the parts to be joined are large and heavy, increase slightly the length of time the iron is held in contact with them.

A good soldered connection can be judged largely by its appearance. It should be shiny, not dull, except with some of the new wartime solders with which anything is possible. If there are points or ridges projecting from the surface of the cold solder, it was chilled too soon—or else the iron was removed too slowly, dragging a tail of solder behind it. If the surface is dull, the solder may never have been hot enough, or it may be that the parts were permitted to move before the solder had fully frozen. If there is too much rosin slopped around the connection, suspect a rosin joint and touch it with the iron again to make sure.

Appearance, however, is not a perfect indication that there are no faults. The test of the physical strength of the joint is a sure test. If the solder is the only permanent physical connection, if the parts have not been physically fastened in place—try to break the joint after it has thoroughly cooled. If you can break it with any reasonable force, it was not good in the first place.

VISUAL EDUCATIONAL FILMS ON OPTICAL CRAFTSMANSHIP

Bell & Howell, under the auspices of the Navy and the United States Office of Education, has produced a series of visual educational units on "Optical Education," using 16-mm sound film. This project was undertaken at the beginning of the war to implement the large scale expansion of American production of precision optics. None of the material had been available previously for the training of the unskilled workers needed in the industry.

A capacity audience viewed the premiere and showed special interest in watching the work illustrated in the six units. William F. Kruse, B. & H. Films Division Manager, was responsible for the production of this set of training films. Terrytoon and McCrory Studios produced the animated sequences.

BOOTH NAMED MERCHANDISING V.-P. OF BELL & HOWELL

J. Harold Booth has been named vice-president in charge of merchandising for Bell & Howell. The move is another step in the company's post-war planning program. Mr. Booth, who has been with B. & H. for 16 years in engineering, sales and executive capacities, is well qualified to take over his new responsibilities. Under his able guidance plans already are emerging from the formative stage into a working design for post-war merchandising.

Bell & Howell, although currently engaged almost exclusively in war production, nevertheless realizes the necessity for planning now to insure continued employment during the reconversion period.

WILLIAM BAUSCH DIES

William Bausch, last surviving son of John Jacob Bausch, founder of the Bausch & Lomb Optical Company, died at his summer home near Rochester, N. Y., on Oct. 19. His age was 83. He was chairman of the board of Bausch & Lomb.

Mr. Bausch, who was a familiar and active figure in the research laboratories of the optical firm until only a few days before his death, celebrated his 83d birthday anniversary last March 25. He was known to hundreds of employees as "Uncle Billy," and his association with the organization covered an expanse of 69 years.

Widely renowned for his developments of optical glass, which grew out of experiments which began in 1903, Mr. Bausch was responsible for the founding of the optical glass making plant at the factory in 1915. It was this plant, the first of its kind in America, which is reputed to have saved the country from chaos when optical glass no longer was available from European sources during World War I.

During that war some 425,000 pounds of optical glass were produced and incorporated in the precision instruments produced by Bausch & Lomb for the military. Emancipation of the United States from dependence on Europe for its optical glass has been of huge value in the present war. Today this strategic material is no longer a problem. This same glass plant, during this war, has produced more than 4,000,000 pounds to meet the needs of the U. S. and its allies.

Mr. Bausch, although active in all phases of the company's business, spent most of his time in experimental work, resulting in the contribution of many patents and inventions, the last one being granted March 28, 1944. He is survived by a sister, Mrs. William A. E. Drescher, and several nieces and nephews.

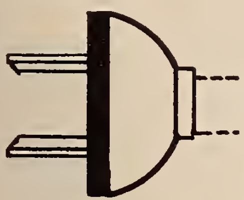
AT YOUR SERVICE

(*Continued from page* 15)

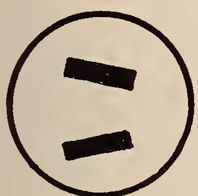
Cleaned and polished switch points cleared up this trouble.—H. M. MORROW, *RCA.*

Improving Plug Contact

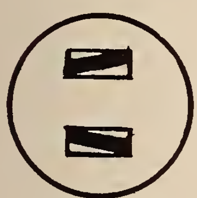
On many installations I have found the speaker plugs on the unit held on with cord or tape. These plugs have caused trouble at times. The slot in the female is much wider than the thickness of the male prongs. This means a sloppy fit unless the prongs on the male section are spread apart. This holds the plug in better but not good enough, and does not help the connection.



Plug contact improved by slightly twisting male plug contacts.



Prongs twisted on male plug.



Prongs making better contact in female plug.

Catch the male prong close to the base with a pair of pliers and give it a twist. One side of the prong will then be against one side of the female slot and the other side of the prong will touch the other side of the slot. This makes a press fit, and the plug or connection will not loosen and cause trouble. See diagram above.—R. O'TOOLE, *RCA.*

Shelf for Spare Tubes

Use a piece of clear white pine 16½" x 2½" x ¾". Cut ¼" notches at ends to fit between brackets on front of 43-A amplifier. Drill four sets of 3/16" holes to match tube prongs of 242-C tubes. Paint black and install. Spare tubes may now be mounted in a handy position for emergency use. Amplifier and rectifier tubes are separated and easily identified, and valuable space in spare parts cabinet can be put to better use.—J. A. DAY, *ALTEC.*

Locating Hum in Simplex Soundhead

If, after carefully tightening leads to exciter lamp mountings on a Simplex soundhead a loud hum is heard, it is because the solder lug on the mounting has moved and is shorting on the exciter lamp holder. I find the simplest way to eliminate this trouble is to slip some large spaghetti tubing about one-half inch long over the lug. Tape will also serve the same purpose.—M. LEVI, *RCA.*

Importance of Clean Optical Systems

For best reproduction it is important that the front of the optical system be kept free from dust at all times. A little dust will diffuse the light at this point causing it to spread into the sprocket holes, thereby creating a hum.—A. C. HOLLAND, *RCA.*

Optical Adjusting Tool

I have found that a small size fibre

(*Continued on page* 30)

IN THE SPOTLIGHT

(*Continued from page* 17)

tion has been successful in obtaining salary increases for its members, and is making steady progress in the enrollment of new members from all parts of the country.

Newly elected officers for the 1944-1945 season are Fred W. Huff, Local 379, Perth Amboy, N. J., *president;* Ralph W. Kautzky, Local 307, Philadelphia, *vice-president;* W. K. Bach, Local 306, New York, *secretary;* Al Kunze, Local 306, *treasurer;* H. Fetig, Local 637, Kingston, N. Y., and T. P. Prendergast, Local 306, New York, *executive committee.*

● Jim Whitebone, business agent of Local No. 440, St. John, N. B., Canada, was elected city councilman. Jim has been president of the New Brunswick Federation of Labor for the past ten years, and for many years was president of the Trades and Labor Council.

● Local No. 110, Chicago, boasts of being the only I. A. local having a member who has been awarded the Carnegie Hero Fund Medal for extraordinary heroism. Some years back, Richard A. Morris, member of the local, jumped into the Chicago River and rescued a woman from drowning. Morris was standing on the deck of an excursion boat, the City of Chicago, and as it passed the dock he noticed a woman who either fell or jumped off the dock. Without a moment's hesitation he leaped into the river and brought her safely to shore. He then swam back to the boat and continued with his trip. Several years later he received an award of $1,000 in cash and the Carnegie medal.

● The Indiana Association of Theatrical Stage Employees and Projectionists held their annual meeting in Fort Wayne, Ind. I. A. representatives John B. Fitzgerald and Frank Olson headed the session and the minutes of the meeting were taken by secretary Bert Steinhauser, Local No. 373, Terre Haute, Ind. A number of delegates reported the signing of new contracts which include provisions for vacations with pay for their members. At the conclusion of the meeting a vote of thanks was given to Fort Wayne Locals Nos. 146 and 466 for their splendid hospitality to the visiting delegates.

● We take pride in reporting another I. A. man who received his army commission the hard way. Charles H. Finch, member of Atlanta, Ga., Local No. 225, and son of one of its oldest members, Ralph Finch, donned the khaki of an army private about two years ago. He received promotion after promotion and now he wears the bars of a captain in the Engineer Corps. The members of his local are mighty proud of him, and many of them, including our friend, Frank Morrison, predicted that young Finch would "go places."

● With the sanction of the union officials, Barney Weiner and Sam Kravitz. members of Local No. 306, New York, run picture shows several times a week for the wounded service men at Halloran and Kingsbridge Hospitals located here.

● Harry W. Mason, Altec inspector formerly servicing the Detroit theatres, has moved his family to Los Angeles, where he will make his permanent home. Mason was very well liked by the projectionists with whom he came in contact and the boys all wish him luck in his new territory.

● Toronto Local No. 173 was well represented at the SMPE semi-annual meeting held in our fair city last month. Dave Siegel, president of the local and Charles Dentelbeck, former president (he held that office for over 21 years), were keenly interested in all the technical sessions, and were very much in evidence whenever and wherever the subject of craft technique was being discussed.

Tom Hoad, chief mechanical engineer for the General Theatre Supply Company in Toronto, and Romeo Vandette, were also members of this Canadian delegation.

● Thomas Kulka, member of Local No. 160, Cleveland, Ohio, attended a Local 306 regular meeting last month as our guest. Tom, who invented a very clever plastic film band you soon will be seeing on all reels in place of the paper ones now used, was very much impressed with the proceedings.

● We are happy to learn that George Thomas, business agent of Local No. 230, Denver, Colo., is recuperating from his recent illness. George is now home from the hospital and is taking a much needed rest. Our best wishes for a speedy and complete recovery.

● Jim Lynette, chief electrical inspector for New York City and a member of the 25-30 Club, was recently elected president of the International Association of Electrical Inspectors. A better man for the job could not have been chosen.

● Lt. William C. Silberberg, son of Herbie Silberberg, an old-time member of Local 306, was awarded the Purple Heart for his part in the recent Aachen drive.

● In answer to our inquiries regarding the present whereabouts of John-Pane-Gasser, member of Local No. 110, Chicago, who was a member of the Metropolitan Opera Company many years ago, we were informed that he is still carrying on with his operatic activities. He is now singing with the Chicago Opera Company, and in his spare time works as projectionist for the Chicago Police Department. These versatile I. A. men!

● Lt. Peter Mulry, member of Local No. 548, Greenville-Paris, Texas, has been reported missing in action. Mulry was a member of a flying fortress that took part in a recent raid over Hungary.

● Harry F. Petty, former business agent of Local No. 163, Louisville, Ky., has been president of the Kentucky State Federation of Labor for many years. He is a member of the board of directors of the Federation's official organ, the "Kentucky Labor News," an excellent publication devoted to the interests of organized labor.

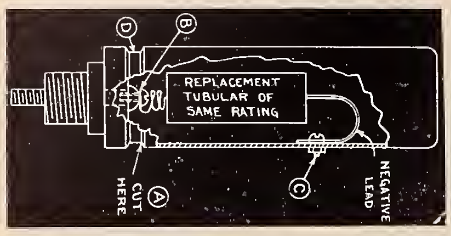
AT YOUR SERVICE

(*Continued from page 27*)

fuse puller sold in most radio and electrical stores a great help in adjusting Erpi optical systems. Use them as you would pliers. Being made of fibre, they do not scratch the brass lens barrel.—F. Ingels, *RCA.*

Mounting for Substitute Condensers

I had some trouble getting exact replacements on certain types of condensers, especially mounting arrangements. I tried the scheme shown on the



drawing below with good results. It is advisable, of course, while making the replacement to use a condenser of a higher working voltage if the additional safety factor is deemed necessary.

Directions: Cut can at (A) and remove contents and clean well. Drill and tap positive binding post (B) for making positive connection to tubular cardboard unit. Make negative can connection with screw (C). Crimp in can at (A) can be rolled out just enough to make a tight push fit on (D).—C. W. Scott, *ALTEC.*

PROCESS IMPROVES TRANSPARENCY OF LENSES

An electrically controlled process that increases the transparency of lenses was demonstrated before the Kiwanis Club of Philadelphia recently when small squares of glass, each having a circular center area treated to make it more transparent than the rest of the square were handed to members.

According to Fred W. Wentker, manager of the Electronic Apparatus Section of the RCA Victor Division, Radio Corporation of America, the treatment promises more efficient cameras, microscopes, field glasses and eyeglasses after the war. He stated that the process consists in applying to both sides of the glass a film of a specific transparent material about five millionths of an inch thick. This film, the thickness and hardness of which is controlled by electron tubes, increases transparency by minimizing the tendency of the glass to reflect light.

20TH CENTURY-FOX DIVIDEND

A dividend of $1.12½ per share on the outstanding prior preferred stock of 20th Century-Fox has been declared by the board of directors. The dividend is payable Dec. 15 to stockholders of record at the close of business on Nov. 6.

U. S. DEPT. LABOR REPORTS ON LIVING COSTS

Reporting as of July 15, the U. S. Department of Labor states that during the past year average prices of family living essentials rose 1.8 per cent, compared to advances of 6 per cent and 11 per cent for the years ended July, 1943, and July, 1942. Over the year the advance was primarily in clothing, house furnishings and miscellaneous services. Food prices were slightly lower than they were a year ago. This is indicative that the fight against inflated living costs has made considerable progress during the past year, due to strong governmental efforts to submerge inflation.

SMPE STATEMENT

(*Continued from page 9*)

motion picture industry, respectfully requests the Federal Communications Commission to grant the frequency band allocations recommended for initiating this immediate post-war industry of theatre television so as to permit the American motion picture industry to maintain its world leadership in the visual and aural entertainment field.

INTERNATIONAL PROJECTIONIST

DECEMBER 1944

VOLUME 19 • NUMBER 12

25c A COPY • $2 A YEAR

"I hear the war's practically over... back home!"

PROBABLY it's only natural for us here at home to feel that the war's almost won, the way the good news has been pouring in.

But the war's not over for *him—not by a long sight!* And he's just one of a few million or more that will stay over there until they finish the bloody mess. Or kill time for a few months—or years—in some hospital.

What about *you?*

This is no time to relax. No time to forget the unfinished business. It's *still* your war, and it *still* costs a lot.

So dig down deep this time. Dig down till it hurts, and get yourself a hundred-dollar War Bond over and above any you now own—or are now purchasing. This 6th War Loan is every bit as important to our complete and final Victory as was the first.

Don't "let George do it"—get *yourself* that *added* bond and help finish a magnificent job *right.* The quicker you reach down deep, the better you do *your* job for war, the more you'll contribute to ending the fight. And the quicker they'll come back—the guys that can *still* be killed.

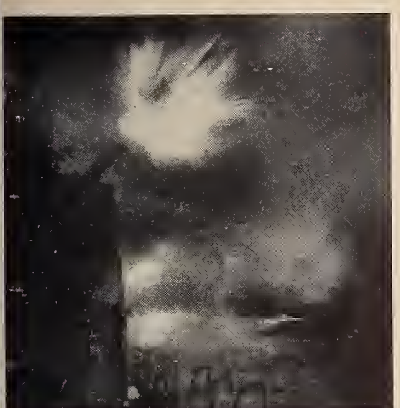
After all, you're safe and sound and *home. That's worth another hundred-dollar bond to you, isn't it?*

6th WAR LOAN

Buy at least one extra $100 War Bond today!

Jap bomb splashes in sea, astern of American carrier. Official U. S. Navy Photograph.

Join the Navy *cameramen* and see the war



Death by night. Inferno-like glare illumines a battle in the central Solomons. Official U. S. Navy Photograph.

Seasoned gunners hold their ears as a U. S. battleship pours shells at point-blank range. Official U. S. Navy Photograph.

THE Navy's in at the beginning of every big show. And right up front where nothing can get between them and their pictures, you'll find the Navy's Combat Photography Units.

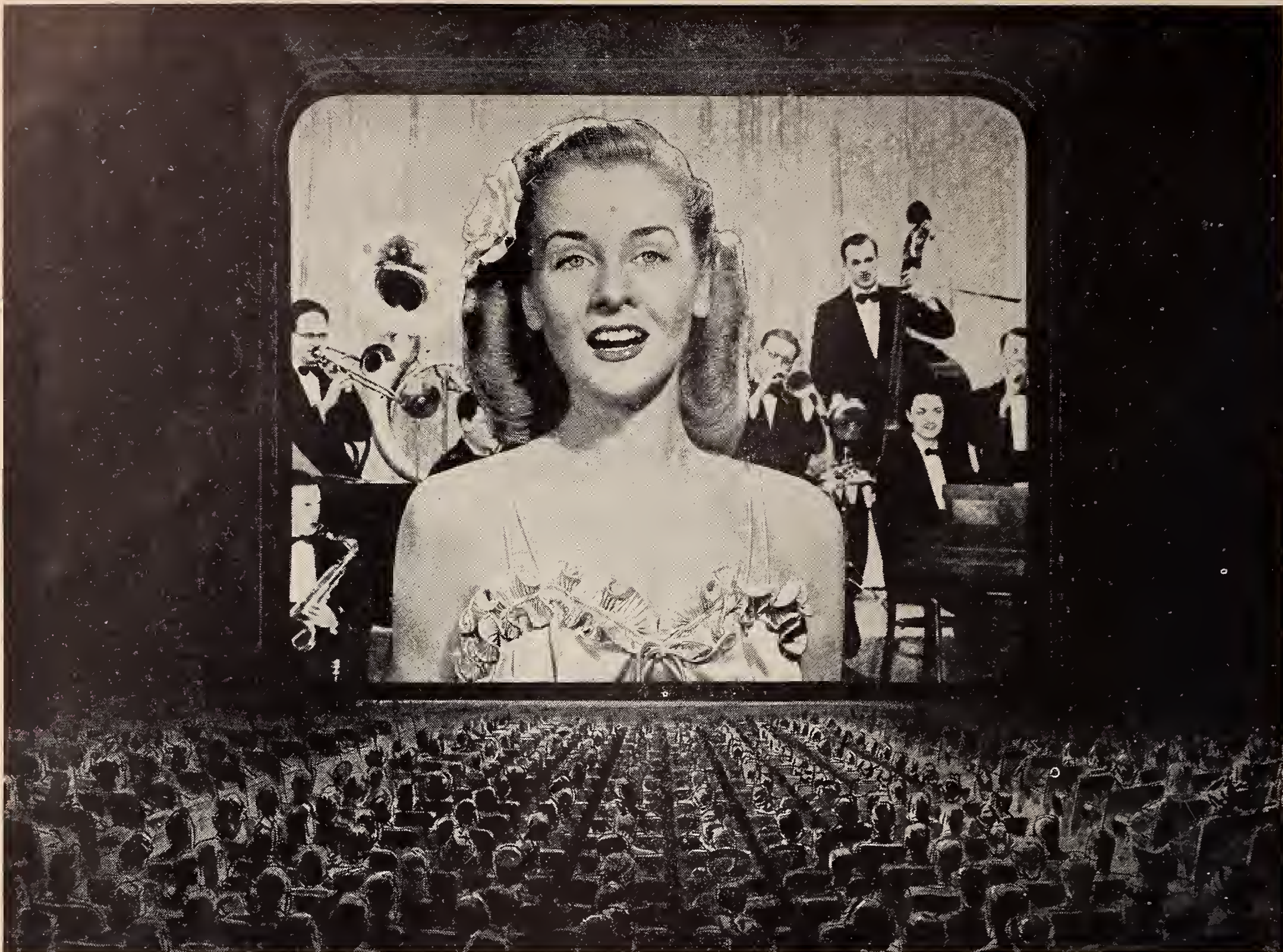
In the Navy, as in all the armed forces, combat photography owes much to "the movies." The movies have sent a lot of their young cameramen to war. Many of those too old to go have served as instructors, turned "green" kids into capable cameramen in an amazingly short time.

And of course movie men with movie methods edit, cut, and mold separate "shots" into finished productions that help plan and fight the war . . . that provide the very best kind of training films . . . and that bring the war to us at home. The Navy combat cameramen's pictures are the basis for an illustrated history of war at sea such as the world has never seen.

Eastman Kodak Company
Rochester, N. Y.

J. E. Brulatour, Inc., *Distributors*
Fort Lee Chicago Hollywood

One of a series of advertisements by KODAK testifying to the achievements of the movies at war



INTERNATIONAL PROJECTIONIST

With Which Is Combined PROJECTION ENGINEERING

W. L. Lightfoot, *Associate Editor*

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Monthly Chat

ANOTHER year soon will have been completed by the industry; another year during which the homefront morale has been bolstered day and night by the active army of projectionists who have performed a remarkable job in the face of many difficulties, chief of which have been the manpower pinch and the need to conserve equipment and parts. The parts supply situation, none too bright at any time during the war period, still demands continued careful nurturing of equipment in use so that "the show can go on." The show will go on in the future just as it has in the past, and the record achieved will be due principally to the patriotic ingenuity of the rank and file of projectionists all over the country who have labored long and willingly so that end will be achieved.

• • •

Television is very much in the air these days, and it will crowd the ether in the years to come in the post-war period. Projectionists alert to the changing pattern already are preparing themselves for the new order of things that assuredly is on the way. The top-flight projectionist of the future will be the one who has a full practical and technical knowledge of the new art. Indicating the progress already achieved in the video world is the first annual convention of the Television Broadcasters Association at the Hotel Commodore, New York. This event is history making for everyone connected with television. and in line with its broad coverage of the changing picture I. P. next month will report the meeting thoroughly, with special emphasis on events of interest to projectionists. The technical discussions will be relayed to readers in language that can be understood by everyone, from advanced students to those still wondering what it all is about.

• • •

When you change your address please notify I. P.'s circulation department as soon as possible, because it is highly necessary if you are to receive your current copy. At least a month's notice is essential, and if possible an additional few weeks so that the continuity of your files will not be interrupted. Strict paper allotments to publishers also make it impossible to print many extra copies, and it is difficult to furnish extra copies of a current issue or back numbers. With this in mind a caution is in order to keep your files intact, because I. P. can't do anything about it until paper restrictions are lifted.

• • •

Recent statements by high officers in the armed services and by war agency officials of the tremendous needs for additional materiel, far beyond original expectations, are about the best available arguments to buy that "extra" $100 War Bond—today.

INTERNATIONAL PROJECTIONIST

VOLUME XIX DECEMBER 1944 NUMBER 12

Making Wiring and Schematic Diagrams: Advanced Steps

By *LEROY CHADBOURNE*

This is the third in a series of articles telling the projectionist how to make his own schematic diagrams of the sound installation. Previous articles pointed out that these diagrams are indispensable for satisfactory maintenance and safety of equipment. They are not easy to make and should not be undertaken during show hours. The present discussion deals with the details involved—first, in completing the wiring drawing, and then, in translating it into a schematic diagram.

As HAS been noted in an earlier article, steps 1, 2, and 5 in the process of making a wiring diagram are comparatively easy; steps 3 and 4 are difficult. Step 4 consists of tracing the wires which connect the terminal points of the different parts.

The difficulty in tracing wires lies in the possible existence of branch circuits. Because of this, the ohm meter may give a misleading indication. Its further use may seem to show that the same wire terminates at three different places — or, in some instances, at ten different places. Therefore, the ohm meter should be used only when absolutely necessary. Insofar as it is used, the only real safety lies in temporarily unsoldering one end (preferably both ends) of the wire in question. It is better to try to follow each wire by hand and eye.

The fact that wires very often are color-coded helps greatly, but this is not an infallible guide. Two entirely different wires may have the same color combination. However, this does not occur very often; as a general rule, following wire colors speeds up the work and helps prevent errors.

Instruments other than the ohm meter should be used only with caution. A high resistance voltmeter and flashlight battery make a safe substitute for the ohm meter. The very inexpensive low resistance moving vane type voltmeter should be avoided. The test lamp should not be used; however, the very smallest type one-volt flashlight bulb, wired to a small flashlight battery to serve as a miniature test lamp, will seldom do any harm. Buzzers should never be used.

Neglect of these precautions may result in burning out some wire or part, or may change the frequency response of some inductive wiring with resultant damage to sound quality.

In the case of speech transformers associated with the photocell or with a photocell amplifier, try to avoid even the use of an ohm meter and use no other instrument of any kind.

Cable Forms

Sometimes a number of wires are tied together to form a cable. The wire the projectionist is following may enter such a group, and unless it is distinctively colored will be very difficult to trace. If necessary, do not hesitate to open a cable form by cutting the cord that holds it together. "Sewing" such forms is quite easy. Just notice how it was tied originally. The knots need not be duplicated exactly.

Figure 1 shows the simple "lock stitch" which is most likely to be encountered inside projection room apparatus. It is started as shown in Figure 2. To terminate this stitch, duplicate the arrangement of Figure 1, but instead of continuing, tie a complete knot. Then take a second turn around the form and tie a second knot.

The lock stitch can be strengthened for large cable forms by making a complete knot at every stage. This will seldom be necessary. Only waxed twine should be used. Any stationary store can supply it. Unwaxed cord may absorb moisture and become loosened.

If a cable form must be opened, do not spread or separate the wires any more than is absolutely necessary for tracing. It will then be easy to re-form the cable neatly with all the wires in their original positions. It will be found that some cable forms have been dipped in moulten

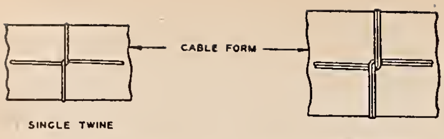
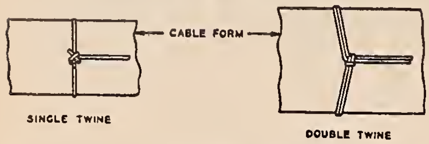


FIGURE 1 *(above)*

FIGURE 2 *(below)*



wax before they were installed in the apparatus. This is an ultra precaution against moisture, and it does not mean the form cannot be opened with safety. As an alternative to opening cable forms, the ends of their component wires can be unsoldered and checked with an ohm meter. If the component wires are color-coded, they can in almost all cases be traced by their colors along with absolute accuracy, without any need for opening the form.

Types of Wiring Drawings

In a previous article on this subject we described one method of making a wiring diagram — namely, drawing a small part of each wire and writing on the drawing where that wire goes. Figure 3 of the present article shows an alternative method, in which the full course of each wire is drawn. The projectionist may take his choice as to which of these methods he prefers to follow.

In following the system illustrated in Figure 3, the projectionist should draw each wire according to the exact course it follows in the apparatus, using no short cuts. The reason is custom. Some other projectionist, or perhaps a visiting service engineer, may at some time use the drawing. As a matter of custom he will expect the path of every wire as drawn to duplicate its path in the apparatus, and probably will be confused if such is not the case.

Some of the wires in Figure 3 are color-coded. Note that the drawing carries this information. For example, the wires leaving transformer T-1, in the upper left-hand corner, are marked, indicating that their colors are brown, blue, red green, and red. Whether the projectionist prefers to make one or the other type of wiring drawing, he should add this information in either case, if the wires are colored.

It has been noted repeatedly that adding apparatus information to the drawing is the third step in making a wiring diagram; that drawing the wires (according to either of the two common methods) is the fourth step, and that adding wiring information is the fifth step. It also has been stressed that trying to carry through more than one step at a time is undesirable because of the chances of confusion and errors. Nevertheless, every rule has exceptions, and the fourth step, that of drawing the wires, often includes parts of the third and fifth steps.

Mixing Procedures

As mentioned previously, if it becomes necessary to disconnect any wire in order to obtain apparatus information (for example, for the purpose of applying an ohm meter to a resistor) it might be well to use that opportunity to apply an ohm meter to the wire also, with the idea of locating its other terminal. The alternative would be to restore the connection after the resistor had been checked, and then perhaps open the connection a second time in order to trace the wire. The step by step method is a good method and advisable, provided it is not carried too far.

Similarly, if the drawing is made according to Figure 3 and the entire course of the wire is drawn in, it would be foolish to avoid combining step five with step four. The color code information (if any) might just as well be written alongside the wire at that time.

However, if the drawing is made according to the method outlined in a previous article, a slightly different procedure may be followed. This consists first in checking over the terminal points one by one, and adding to each the number of wires connected to it—one, two, or more, as the case may be. That completes the fourth step. The course of the wires is not checked at this time. After the correct number of wire stubs have been added to each terminal the course of the wires is determined (by following them with eye and hand, by use of the ohm meter, or by reliance on the color code) and the appropriate information is then written alongside each wire stub. This completes the fifth step.

IMPORTANT CAUTION: In opening connections, regardless of the reason, never open more than necessary at one time. Opening several connections at the same time may lead to mistakes and to miswiring of the apparatus when they are restored. If it becomes necessary and unavoidable to open several connections at one time *do not rely on memory* for their proper restoration. The best and the most experienced men can make mistakes. Whenever there is the slightest chance that an error might possibly be made use very small price tags for temporary identification of both the wire and the terminal from which it came.

Because connections may have to be opened in the course of ordinary trouble shooting as well as for such special jobs as the one described in this series of articles, it is a good precaution to keep a bunch of these small tags permanently with the spare parts in the projection room. As a relatively unsatisfactory substitute any small bits of paper or pasteboard may be used, and fastened in place with friction tape, or by any other convenient temporary means.

The task of making the wiring diagram has now been traced in detail. The reader may be inclined to think that if the

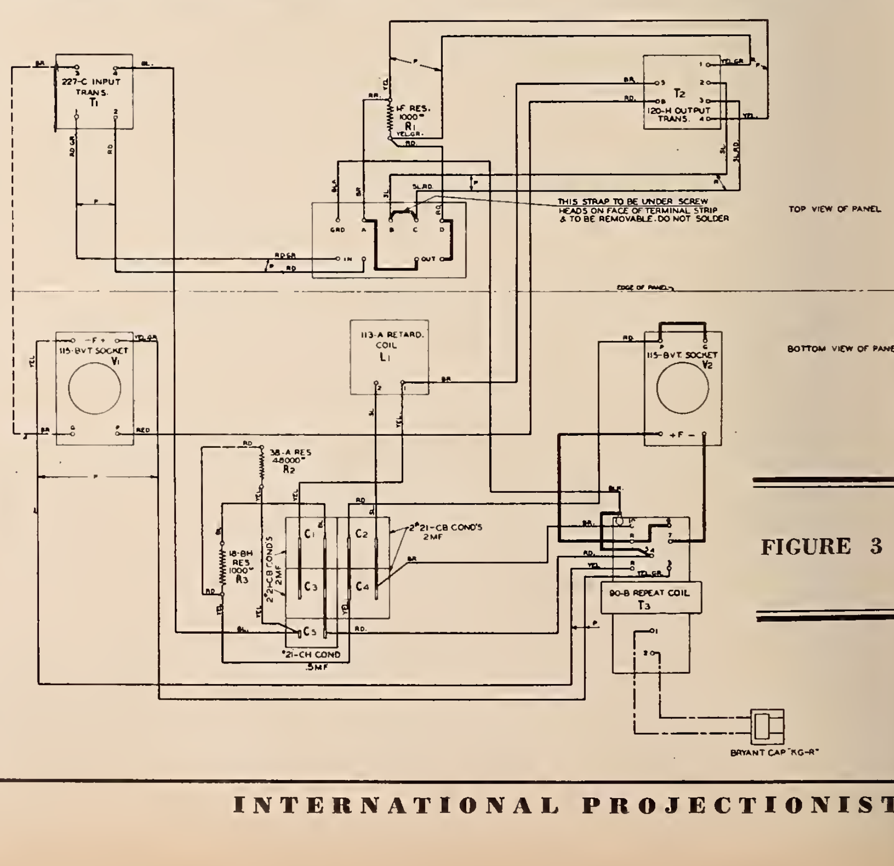


FIGURE 3

wiring diagram involved so may difficulculties that making the schematic would be even more complex. The opposite is true. The wiring diagram, in addition to its value for its own sake, is the most efficient preliminary to making the schematic. In fact the schematic, although not a single line has been put on paper for it, is more than half completed once the wiring diagram has been correctly drawn.

When the wiring diagram is completed the projectionist can close the apparatus. The schematic is not made from the apparatus in that case, but from the wiring diagram. The schematic need not even be made in the projection room. It may be drawn anywhere—all that is needed is a table and chair, pencil and paper, and an accurate wiring diagram from which to work.

Circuit Data Essential

One other thing is needed—the man who makes the schematic must understand his electrical circuits. The schematic is only a translation of the data already incorporated in the accurate wiring diagram. The wiring drawing contains and shows *physical* facts — where parts are placed, what wires connect them, and so on. The schematic diagram translates this data into *electrical* facts —how the parts are related electrically, which parts function in electrical cooperation, and the like. Its purpose is to make the *electrical* arrangements clear and simple, and easy to understand, in order to facilitate the work of maintenance and repair.

Figure 4 shows the schematic diagram that can be drawn from the wiring diagram of Figure 3. Note the tremendous improvement in *electrical* simplicity. To determine electrical relationships by reference to Figure 3 alone would, in fact, require forming a tentative Figure 4 in the reader's mind, even if not on paper.

The process of making Figure 4 out of Figure 3 involves four (not five) steps,

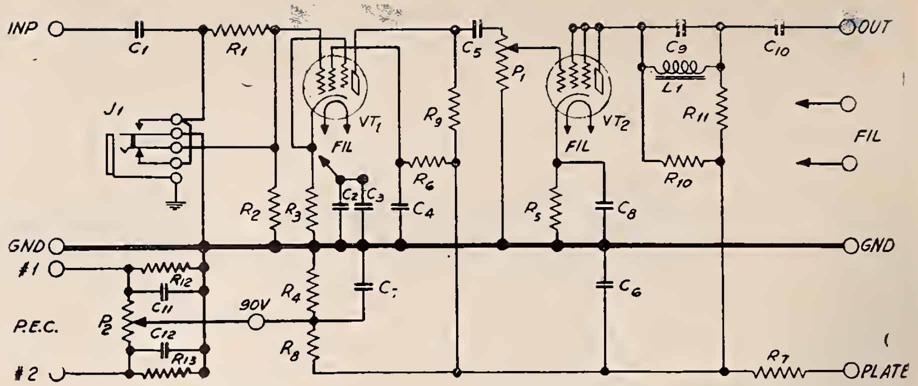


FIGURE 5.

but these cannot always be clearly divided; a very rigorous step-by-step process is not efficient in this case, and is hardly necessary because chances of confusion are less. The projectionist is working at ease with two pieces of paper and a pencil. He is not squatting or kneeling before the apparatus and trying to juggle pencil, paper, soldering iron, ohm meter and flashlight simultaneously. Hence he can and should scramble the four steps required in making Figure 4 out of Figure 3, as the situation of the moment may seem to require.

The four steps are (1) *making a parts layout of the major parts;* (2) *completing the parts layout by adding the minor parts;* (3) *drawing in the wires, and* (4) *adding the parts and wire information.* This fourth step, particularly, should be scrambled in with the other three as occasion indicates.

The first step is the most vital, because it controls the appearance and clarity of the finished drawing but seldom is very difficult. The second step often is harder and more dubious, and should to a considerable extent be scrambled with step three.

Step one—starting with blank paper, the schematic symbols for the tubes and transformers are drawn in. The important point is getting them properly located, in which connection custom should be followed—otherwise a relief projectionist or service inspector may waste considerable time in an emergency trying to figure out how the schematic is arranged.

Custom dictates that the sound input should be located at or toward the left of the drawing, and the sound output toward the right. In the case of an amplifier, power input generally is shown at the bottom. In a rectifier the power input may be shown at the top and the d.c. output at the bottom, or input at left and output at right. Most readers of I.P. have seen enough schematics in these pages to have a good general idea of the customary methods of representation. Such readers will remember that in an amplifier the amplifying tubes are usually arranged in a line across the top of the drawing, with the rectifying tubes segregated at the bottom, or at the bottom, or at the bottom right.

It will be seen that these customs are followed in Figure 4, with the speech input transformer at top left, speech output transformer at top right, amplifying tube at top, power transformer and rectifier at bottom center.

Difficulties appear, in working from the wiring diagram, when it becomes necessary to determine which tube is which, and which transformer is which, etc. These facts are not always instantly apparent. To determine which tube is a phase inverter or a monitor amplifier or a push pull tube, it may sometimes be necessary to trace a number of wires and sketch a partial schematic on a different piece of paper in order to get the facts clearly in mind.

In Figure 3, which is a simple drawing, there are two tubes. Inspection shows that the plate of V-1 is wired directly to an output transformer, while the plate of V-2 is jumped to its own grid. The meaning of the first fact may be dubious, because the projectionist may not in every case have enough apparatus information to know that the transformer is an output transformer; but there can be no doubt about the meaning of jumping together the grid and plate of a triode—the tube so wired is a rectifier. Therefore, the other tube must be the amplifier tube, and the only

(*Continued on page* 23)

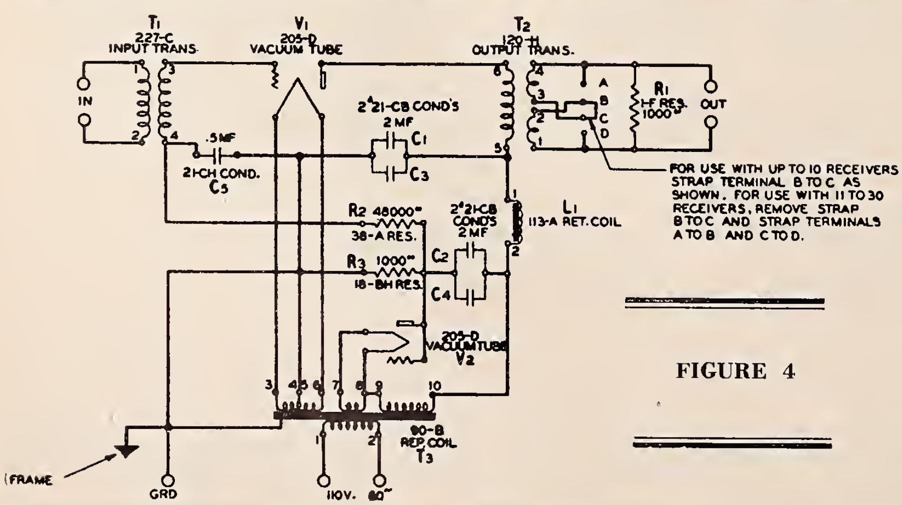


FIGURE 4

Importance of 16-mm Film in Television

By *JOHN FLORY*

EXECUTIVE PRODUCER, GRANT, FLORY & WILLIAMS

The case for 16-mm film is presented by a producer-writer-director of documentary and public relations pictures, and appeared in a recent issue of Television, a monthly publication. A graduate of Yale University, where he studied in the drama school under the late Professor George Pierce Baker, the author is now executive producer for the New York motion picture producing firm of Grant, Flory & Williams.

IF TELEVISION is to become an art form separate and distinct from stage, screen or radio, it must pioneer new fields of entertainment and popular education, and must develop fresh techniques. One of the most promising techniques open to producers of television programs is the so-called *documentary* approach as used in 16-mm film production.

Television may well appropriate to itself many principles of the documentary film, should indeed have no false pride about interspersing live studio scenes with specially prepared and cued motion picture sequences to add pace and variety of scope.

Production of these movie shots will present unique problems. They must be filmed in the world at large under field conditions calling for smaller camera crews and lighter equipment than Hollywood is accustomed to rely upon. Expenses must be kept to a minimum, particularly during the post-war period, while financial support of television is being cultivated.

Hence, any consideration of motion pictures as an element in television programming should fully weigh the merits of 16-mm film—the width most generally used by educational institutions and the armed services for training purposes—versus the wider-gauge 35-mm film, which is the standard size for virtually all movie theatres.

Cost of programs transcribed on motion picture film can be very great, it has been pointed out by opponents of film in television. But it is because 16-mm film promises to reduce drastically the cost of preparing special films for television purposes that it deserves to receive more attention than it has to date.

In addition, it possesses certain advantages of ease and safety of handling, which make it particularly suited to the speed and scope that television programming will demand.

Since all 16-mm film—in contrast to its explosive 35-mm nitrate cousin—is manufactured on slow-burning acetate safety stock, its use means that motion picture production and editing activities can take place in ordinary rooms and buildings without incurring fire hazards. In large cities, strict regulations usually prevail upon the type of building and the conditions under which 35-mm nitrate films are used and stored. These handicaps do not affect the 16-mm producer.

Since it would seem advantageous to have the filming activities of a television studio located adjacent to the studio itself, this would require more expensive and complicated fire-resistant construction unless 16-mm film is used.

Libraries of syndicated motion picture programs may be the backbone of many television stations for years to come. These programs, for the sake of convenience, may well be distributed on 16-mm film even in those cases where original production has been done on 35-mm equipment. Storage of motion picture film becomes a relatively safe and simple matter when the more compact and narrow-gauge film is employed.

A 10-minute 35-mm reel packed for shipment weighs in the neighborhood of six and three-quarter pounds, whereas a 16-mm reel of the same running time only weighs one pound. This means a saving of $5.03 when sending a 10-minute film program by air express from Los Angeles to New York, not to mention savings along the line in labor, handling and trucking where a volume of films is being shipped.

There is considerable saving in the matter of 16-mm release prints. A 35-mm release print may cost about $25, whereas a 16-mm print of the same subject can be bought in the neighborhood of $10.

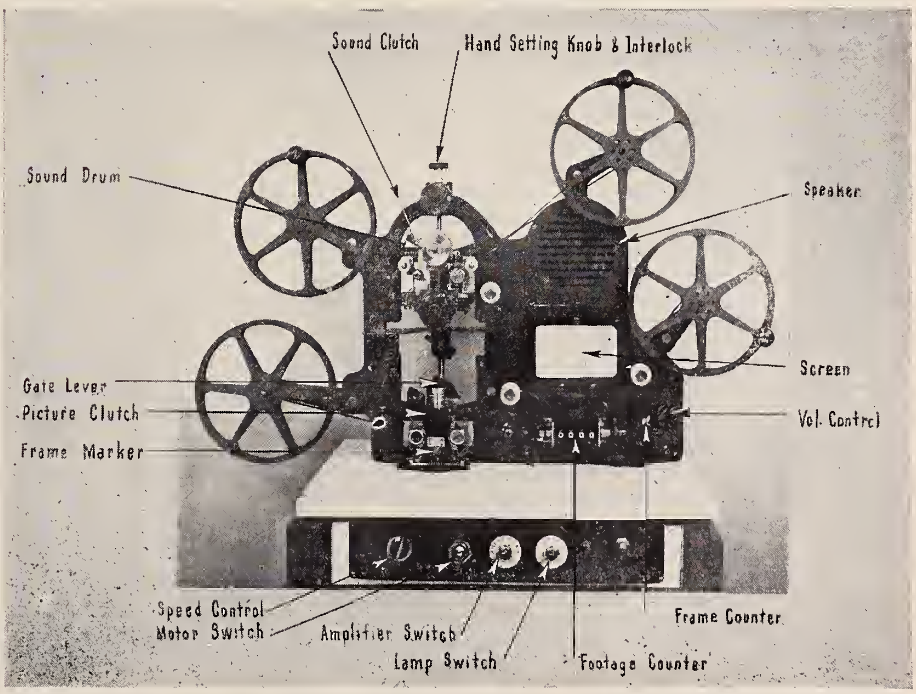
Satellite Setup

Where a non-originating or satellite television station has to set up film production equipment in order to have enough material and variety to maintain a reasonable broadcasting schedule, the initial outlay for 16-mm equipment is roughly one-half or less than that which would be required to set up the same type of 35-mm facilities.

The cost of coaxial cables or of the booster stations which are necessary for the achievement of a network is very great, so that it may be as many as 10 years before the 106 metropolitan markets having 100,000 or more population are linked together in television networks—unless this can be done in the beginning through the use of film.

When it is realized that nearly 62,000,000 other people live in rural sections or in urban centers having populations of less than 100,000, it can be readily seen that film may be the only economical way of bringing network program material to the smaller-town television broadcasting station. The program manager of such a station will be forced to rely on motion picture film for the bulk of his outside and community coverage.

Narrow-gauge motion picture equipment is so much easier to handle than the cumbersome and complicated 35-mm



Combination picture-and-sound editing machine for 16-mm films has been developed for postwar television use by a New Jersey manufacturer under the brand name of Filmsolector.

cameras that it is inevitable that it will be preferred. Besides this, many a small town has a local photographic supply shop whose owner is set up to take 16-mm movies, and who, on a free-lance or retainer basis, can prove a valuable ally of the local television station.

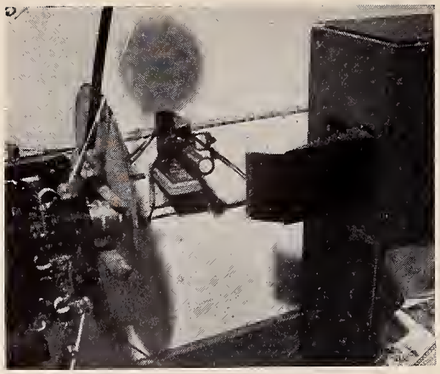
The war has put a spotlight on the advantages of visual aids. Experts in the field predict a vast post-war boom. According to Professor L. C. Larson, chairman of the Educational Film Library Association, within a post-war decade more than 100,000 schools will be equipped to show 16-mm classroom films. This will mean the development of a whole group of motion picture producers, most of whom will not be located in Hollywood and, therefore, not saddled with the high overhead and expensive cost setup prevailing in the movie capital.

These educational and documentary film producers will have experience in shooting under field conditions. They will know how to tell a story through the adroit portrayal and rearrangement of real people, real backgrounds and real, live situations. Thinking in these terms they will be ideally fitted to prepare a considerable portion of the human interest programs which the television industry may wish to have recorded on film for telecast.

Indeed, some of those objections which have been made to the use of motion picture film in television programming because of cost may be automatically resolved. The producer of such television films will be enabled to get back much of his production cost through the byproduct sale of some of these television pictures to schools, colleges, adult-education and other non-theatrical groups after the films have been given a first-run showing over a television network.

It has been estimated that there are well over 1,000,000 amateur movie makers in the country. While a certain number of these own 8-mm cameras, there must be several hundred thousand advanced amateurs equipped with 16-mm cameras capable of taking pictures at sound speed which would permit their films to be intercut with professionally produced footage.

You may remember the newsreel pictures which showed the collapse several years ago of that great suspension bridge in the Pacific Northwest. These were caught on the spot by means of a 16-mm camera. Many spectacular news stories involving floods, fires, accidents, train wrecks and other sudden calamities can be covered visually by means of 16-mm movies far more readily than they are today in 35-mm newsreels. Thus the amateur movie man becomes a valuable contributor to the development of the video aid.



16-mm film projector and television camera for transmitting film at W9XZV (Zenith) are pictured with 2" x 2" combined glass-slide and film-strip projector in center.

Supplementing the news-event subjects is that great mass of intensely interesting and novel material existing in everyday life but which, because of inaccessibility or the fact that it is so much everyday life, cannot be filmed either by professional 35-mm cameramen or picked up by mobile television units on any kind of economical basis.

There has been some question on the part of television station managers as to the relative merit of 16-mm and 35-mm films from a quality standpoint. Consensus of opinion seems to be at the present time that 35-mm pictures offer slightly better clarity. This is due no doubt to the fact that the grain in the emulsion of a 35-mm frame is proportionately smaller than the same size grain in the 16-mm frame; hence, it is not so noticeable when the image has been enlarged for projection.

Another fact which may be the cause of this viewpoint is that much of the 16-mm footage now available consists of hastily made reduction prints from propaganda films never originally photographed with an eye to their being televised.

A third objection to 16-mm film on the ground of quality has been the sound. In general, it is thought that the average present-day 16-mm projector is not capable of reproducing a sound track entailing frequencies of more than 5,000 to 6,000 cycles, and generally not more than 4,000 to 5,000. The average neighborhood theatre generally does not give sound much more than 8,000 cycles at its upper level.

It should be noted in connection with any discussion of sound that the characteristic of the curves within the frequency range of a motion picture recorder reproducing system is more important than the extent of the range itself.

Production of video commercials on film may very well develop into a specialized phase of the industry by itself. In many cases these may be conceived by advertising agencies, but the actual production probably will be handled by television film producing units having particular aptitude and facilities for this type of work.

In addition to the animated cartoon technique, these visual announcements in their constant demand for novelty will call upon every trick of the motion picture art—three dimensional stop-motion, slow- and speeded-action, optical printer effects using traveling mattes, growth and time-lapse studies, photomigrography, superimposures, montages. Some of these effects can best be achieved by 35-mm film methods, but many of them can be accomplished directly with 16-mm equipment—a factor which may be of some importance when it is considered that these short film plugs will tend to be produced locally under the direct supervision of the sponsor and his advertising counsel.

One of the most promising fields of experimentation aimed at making 16-mm motion pictures of importance to television is being explored by Harry Millholland of the Allen B. DuMont Laboratories. At a meeting of the Television Producers Association in New York, a reel was shown of 16-mm movies, which Millholland photographed directly from one of the DuMont station monitor screens.

Imperfect as these pictures are, they represent a significant engineering achievement and point the way to the time when it will be common to make a sound motion picture record of a television program directly from the television receiver screen itself.

It is still too soon to say with certainty whether the photographic and sound quality of such movies snatched out of the air will be sufficient to permit such films to be re-televised. If this can be done, a great step forward will have been achieved in cutting program costs. Live television shows put on in big cities such as New York, Chicago or Los Angeles could be transcribed, so to speak, and syndicated later to hundreds of stations in smaller areas by the use of air-expressed film, without the expense of maintaining expensive coaxial cable or relay station networks.

KEILHACK NAMED BY N. T. S.

Francis Keilhack has been appointed manager of the Kansas City branch of National Theatre Supply, according to W. E. Green, president. Arthur (Count) de Stephano, former manager of the Kansas City office, has been made superintendent of both the Kansas City and St. Louis branches.

ALTEC BUYS $55,000 WAR BONDS

Altec Service has bought $55,000 worth of Treasury notes in support of the motion picture industry's support of the Sixth War Loan Drive, according to Bert Sanford, Eastern division sales manager.

Projectionists' Course on Basic Radio and Television

By *M. BERINSKY, E.E.*
MEMBER OF INSTITUTE OF RADIO ENGINEERS

VI.—MAGNETISM (*Continued*)

A PRELIMINARY discussion of the principles of magnetism was dealt with in last month's article of this series. A more detailed explanation will now be given.

We have seen that magnetic lines of force seem to emerge from the N-pole of the magnet and to enter the S-pole. The direction of these lines may be seen very clearly in Figure A (this appeared as Figure 3 in last month's installment). These lines may be assumed to continue to travel through the magnet from the south to the north pole. Closed loops of magnetic lines are thus formed. These loops or lines are called lines of induction or "maxwells." The entire path through which the lines of force pass is called the magnetic circuit. Each of these lines is continuous. It follows, therefore, that in a single magnet neither a north pole nor a south pole can exist by itself. Also, all of the north poles will be equal in magnetic strength to all of the south poles.

The influence of a magnet is extended well beyond the region of the magnet itself. This is shown by the fact that iron and other magnetic substances are acted upon even when placed at some distance from the poles of a magnet. The strength of the magnetic field at any point is represented by the density of the magnetic lines of force at the point.

Figure 1 shows the effect of breaking a bar magnet. If such a magnet is broken, north and south poles will appear on each fragment. In each fragment the strength of the north poles is equal to the strength of the south poles.

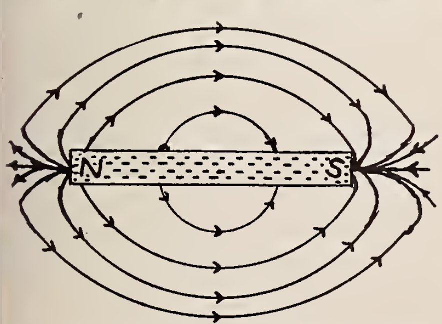


FIGURE A. *Magnetic lines of force around a bar magnet. Note the direction of the field (out of the north pole and into the south pole).*

Consequent Poles

Consequent poles are magnetic poles which form on the sides of a magnet rather than at the ends. Such poles for a bar magnet may be seen in Figure 2. Consequent poles are found in bar magnets where different portions of the magnet have been rubbed by a north or a south pole.

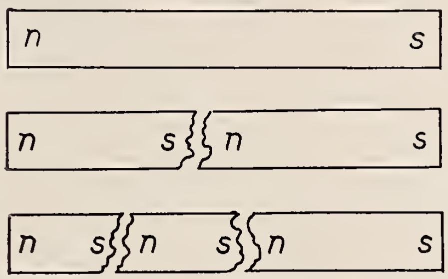


FIGURE 1. *(a) Top, north and south poles of magnet; (b) center and bottom, effect of breaking a bar magnet.*

Another method of producing consequent poles is to place the bar magnet into the core of electric exciting coils which are acting in magnetic opposition. These poles are really due to the fact that the bar consists of two or more magnets placed so that two north or two south poles exist in the same portion to the magnet.

Theory of Magnetism

Although much has been learned in recent years about the behavior of atoms and molecules, little, if anything, has been developed to explain why certain materials can be magnetized while others can not. Iron molecules, for example, seem to be pretty much like those of other metals, yet their magnetic qualities are far superior to those of other metals.

We know also, that alloys of iron and nickel, iron and copper, aluminum, nickel, and cobalt, etc., have magnetic qualities which are far superior to those of any of these metals acting alone. Why this is the case has not yet been satisfactorily explained. The molecular theory of magnetism which is used today was first explained by Wilhelm Weber and later expanded by Ewing. The theory is now known as the Weber and Ewing theory in honor of the two scientists. These theories are quite old but modern physics has been unable to improve on them to any substantial degree.

In the Weber and Ewing theory each of the molecules which make up the magnet is assumed to consist of a very small magnet with its own north and south pole. When the magnet has lost most of its magnetism it acts almost like an ordinary piece of iron. Under these conditions the tiny magnetized molecules are arranged in a haphazard manner so that all of the north and south poles neutralize one another, and no external magnet effect is observed.

Figure 3-a shows a de-magnetized piece of iron. Notice how the molecules are arranged in this figure. When a magnetizing force is applied to the iron bar changes take place in its molecular structure. Upon the application of such a force the magnetized molecules tend to arrange themselves so that their axis are parallel and their north poles are pointing in the same direction as the force. In Figure 3-b we see how these molecules would look if they were large enough to be seen.

Notice the difference between the molecular arrangements in Figures 3-a and 3-b. In Figure 3-b, since all of the magnetized molecules are arranged in an orderly fashion, their respective magnetic strengths add and a strong magnet results.

You may wonder why iron has such good magnetic qualities while other metals appear to be inferior in this respect. The explanation may be found in Figure 3-b. In iron the molecules line up very quickly when a magnetizing force is applied. In other metals these molecules never seem to thoroughly line up as shown in Figure 3-b. The result is a weaker magnet.

What would happen if we were to break

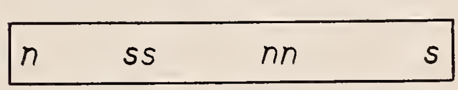


FIGURE 2. *Cousequent poles.*

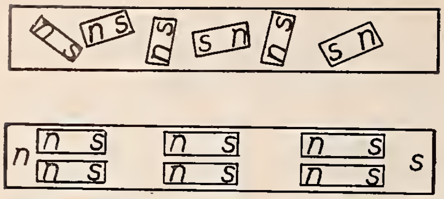


FIGURE 3. *(a) Top, non-magnetized iron; (b) bottom, magnetized iron.*

a bar magnet? Figure 1-a shows a bar magnet with north and south poles clearly labeled. If such a magnet were broken a north and south pole would be created at the points where the break occurred. This may be noted in Figure 1-b. Notice the polarity of the magnetic poles in the whole bar magnet. When this bar was broken the half which had a north pole at the end developed a south pole at the point where it was broken, and the half which originally had a south pole developed a north pole at its broken end.

It seems at first that the poles which developed at the broken ends appeared from out of nowhere. Actually, they were always there but when the magnetized bar was in one piece the north and south poles at the center of the magnet, being equal and of opposite polarity, cancelled each other. This theory is further supported by the fact that if a permanent magnet is ground into very small particles, each of the particles will possess the properties of a bar magnet, and each particle will have its own north and south pole.

Attraction and Repulsion

When we studied the electron theory we found that a positive charge will attract a negative charge; a positive charge will repel another positive charge; a negative charge will attract a positive charge, and a negative charge will repel another negative charge. Such rules also apply to magnets and will now be given.

1. *A north pole will attract a south pole.*
2. *A north pole will repel another north pole.*
3. *A south pole will attract a north pole.*
4. *A south pole will repel another south pole.*

These rules are very important and should be memorized. The action of many radio and electrical circuit components depends upon these rules.

If a north pole of a magnet is brought near the south pole of another magnet, a force of attraction will be observed. If one of the magnets is placed near the side of the other magnet instead of being placed near to the pole it will be noticed that the force of attraction is diminished to some extent. This is due to the fact that the force of attraction is greatest at the point where the lines of force are most dense. Since the lines of force of a bar magnet are most dense at the poles, it follows that the greatest force of attraction will be at such a point.

Compass Needles

A compass needle consists of a small bar or needle of hardened steel permanently magnetized and accurately balanced upon a sharp pivot or jewel. Hardened steel is used because of its ability to retain its magnetism for exceptionally long periods.

The north pole or north seeking pole, as it is sometimes called, points towards the north magnetic pole of the earth. The north magnetic pole of the earth is located somewhere in the Hudson Bay region and does not coincide exactly with the north geographic pole of the earth. The south pole of the compass needle does not point to the south geographic pole of the earth, but, rather, to the south magnetic pole. The north pole of a compass needle is frequently colored blue, or is given some other identifying mark.

The most important use of the compass is for navigation purposes, but other uses have been found. In electrical work it is often desirable to be able to identify the poles of permanent and electrical magnets. The compass needle is used for this purpose. When the north pole of a compass needle is brought near the north pole of a magnet it will be repelled, and when it is brought near the south pole of a magnet it will be attracted. Thus, we are able to identify the polarity of the poles of a magnet.

We know that lines of force which are invisible exist around the poles and sides of a magnet. Because these lines of force are invisible we may have our doubts as to their existence. The following experiment is suggested to prove the existence of magnetic lines:

Sprinkle some iron filings on a piece of paper. Hold a bar magnet under the paper. The iron filings will line up in such a way as to trace out the lines of magnetic force. Notice that the lines are greatly concentrated at the poles of the magnet.

NOVEMBER QUESTIONS AND CORRECT ANSWERS

1. (Q.) A parallel branch of 40 and 60 ohms is connected in series with another parallel branch of 10, 20, and 50 ohms. Find the total resistance of the circuit. ***(A.) 29.98 ohms.***

2. (Q.) If the line voltage is 1,000 volts, find the total line current. ***(A.) 33.4 amps.***

3. (Q.) Find the voltage across the 40-60 ohm branch. ***(A.) 802 ohms.***

4. (Q.) Find the voltage across the 10-20-50 ohm branch. ***(A.) 198 ohms.***

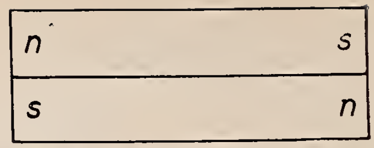


FIGURE 4. *Proper method of storing bar magnets.*

Several interesting experiments can be performed with iron filings and bar magnets. Place two bar magnets so that their adjacent poles are unlike. Hold the paper with the filings over the magnets. Notice that the lines between the adjacent poles seem like elastic bands stretched from one pole to the other, acting to pull the unlike poles together.

Now let us try another experiment. Place the two magnets so that their adjacent poles are alike. Hold the paper with the iron filings over the magnets. Now the lines of force between the adjacent poles appear to repel one another, indicating a state of repulsion between the poles.

Magnetic Induction

If a magnet is brought near a piece of soft iron, the piece of iron becomes magnetized. This is known as magnetism by induction. If the south pole of a permanent magnet is brought near a piece of soft iron the part of the iron nearest the inducing magnet will have a north pole induced in it. If the north pole of the permanent magnet is brought near the soft iron, the part of the iron nearest the north pole will have a south pole induced in it. The explanation is not difficult.

Let us consider the second case. A north pole of a permanent magnet will induce a south pole in a piece of iron at the point nearest to it. The lines of force leaving the north pole of the permanent magnet will concentrate in the piece of iron because they can pass through the iron more easily than through the air. Since these lines must enter the iron at the point nearest the north pole, a south pole is induced in the iron. We know that lines of force always leave a north pole and enter at the south pole.

Storing Magnets

If a strong north pole is brought near a very weak north pole attraction sometimes results. This does not violate our rules of magnetism which tell us that like poles repel. The explanation lies in the fact that the strong north pole will overpower the weak north pole and will then induce a fairly strong south pole at the point where a weak north pole originally existed. Thus, we see that it is possible to reverse the polarity of a weak magnet by placing it near a strong magnet.

When permanent magnets are to be stored away they should be placed in the position shown in Figure 4. Here the

magnets are shown stored so that their adjacent poles are unlike. Under these conditions the magnetism will be better retained in both magnets and the possibility of reversed polarities will be eliminated.

When horseshoe magnets are to be stored away for long periods, a piece of soft iron should be placed across their poles. This will prevent deterioration of the magnetic field. When soft iron is used in this manner it is known as a "keeper" because it tends to keep the lines of force in the magnet and prevents them from flowing through an air gap.

Magnetism may be preserved by other methods too. Magnets should never be subjected to excessive heat or vibration. When magnets are used for precision purposes, such as in voltmeters and other indicating equipment, certain precautions must be taken so that the magnets will not change in strength over periods of time. The methods used are known as "artificial aging." Magnets may be aged by subjecting them to temperatures of 120° C. for about one hour. Another method is to heat the magnet from 20 to 40 hours at a temperature of 100° C. Sometimes the magnet is mechanically vibrated during the heating process.

Magnetic Shielding

Magnetic lines of force can not be shielded entirely. Non-magnetic materials seems to have no effect whatever on the pulling ability of a magnet when placed between the pole of the magnet and the iron which is being pulled. Shielding is often desirable, however, especially in sensitive meters. These meters should be guarded against stray magnetic fields due to generators, conductors carrying currents, and the earth's magnetic field. Thin iron shells usually are placed around the instrument to be shielded. The iron will by-pass nearly all of the stray magnetic flux before it can reach the sensitive parts of the meter.

Better shielding is obtained when the iron shield has tiny openings or air spaces so that it takes on the appearance of a screen. The smaller the aid spaces the more effective will be the shielding. Three or four shells placed side by side give better shielding than one shell of the same total thickness. Because of the expense of using three or four shells, such careful shielding is used only on instruments costing over $100.

The bar magnet is not generally suitable for commercial applications. In practice, a strong air gap usually is desirable. The closer the spacing between the opposite poles, the greater will be the flux density of the air gap. This means that a shape other than a bar magnet must be used because in a bar the spacing between opposite poles will be a maximum.

A horseshoe-shaped magnet is more practical in commercial work. Such a magnet is used in voltmeters, wattmeters, magnetos, electric bells, telephone receivers, earphones, and some types of loudspeakers. Laminated magnets are also common in commercial work. Laminated magnets are stronger in proportion to their weight than thick ones of the same dimensions. More uniform hardening can be obtained with thinner metal in the heat treatment process.

Magnetic Units

The measurement of magnetic quantities is much more difficult than that of electrical units. The accuracy which is possible is also less reliable. Several magnetic units will be explained.

The first is called "permeability." The permeability of a substance tells us how much easier it is for lines of force to travel through that substance compared to air. The permeability of air is 1. The permeability of some types of iron is 4,000. This means that it is 4,000 times easier for magnetic flux to travel through this type of iron than it is for the same flux to travel through air. The symbol for permeability is the Greek letter Mu (μ).

In paramagnetic* materials the permeability is greater than 1, and in diamagnetic* materials it has a value of less than 1.

The magnetic flux is the total number of lines of force existing in a magnet. The symbol for flux is the Greek letter Phi (ϕ). The unit of flux is sometimes called the "maxwell" in honor of J. C. Maxwell, the English scientist. Flux is also referred to as "lines."

Another unit in magnetism is the magnetomotive force. This is the force which moves the flux through the magnetic circuit. The symbol for magnetomotive force is (M.M.F.). The unit is the "gilbert."

* *I. P., page 22, Nov. 1944 issue.*

When flux is driven through a magnetic circuit by a magnetomotive force it encounters some magnetic resistance. This resistance is called "reluctance." The unit of reluctance is the "oersted." The symbol for reluctance is (R).

A similarity exists between magnetic calculations and Ohm's Law. Flux is similar to current; magnetomotive force is similar to voltage; and reluctance is similar to resistance. Mathematically, the formula for magnetic current is similar to electric current, thus, $\phi = \dfrac{\text{M.M.F.}}{\text{R}}$.

DECEMBER QUESTIONS

Fill in the blank spaces

1. A north pole will . . . . a south pole.

2. A south pole will repel a . . . . pole.

3. A north pole will induce a . . . . pole in the end of a piece of iron nearest to it.

4. Name three uses for permanent magnets in radio or electrical work.

The correct answers to these questions will appear in the next issue.

MODERN EQUIPMENT FEATURED IN W. E. BOOKLET

Western Electric Co. has distributed to its more than 90,000 employees a 40-page booklet, "Circuits for Victory," which depicts the gigantic role of communications weapons in modern warfare.

Published by W. E., and using the pictorial technique, "Circuits for Victory" projects the success of modern communications equipment in war against a backdrop of the organization's 75 years of leadership in the design and manufacture of telephone and communications facilities for the nation in peace and war. The booklet reveals how progressive improvement in designs and methods by Western Electric and the Bell System advanced the telephone and radio from a neighborhood curiosity to a world-wide network of voice channels, and how these communications devices and others now are helping to spark the attack on all battle fronts.

IN THE SPOTLIGHT

By *HARRY SHERMAN*

IT IS with keen interest that we follow the trend of exhibitors all over the country to take advantage of every opportunity to increase their box office receipts. Come Saturdays, Sundays, and holidays and up go the prices of admission—from the small neighborhood theatres to the large de luxe houses. Why? We don't know.

The running expenses for week-ends and holidays are the same as for week days. As a matter of fact, it has become a common practice for some of the de luxe theatres to cut their shows by eliminating one or two shorts in order to get a quicker turn-over of patrons. We have in mind one particular de luxe house whose admission price is boosted from 99c on week days to $1.50 on Saturdays. Sundays and holidays. The show is cut to just the feature picture and about a 25-minute stage show. Even the newsreel, which is a *must* in most theatres, is cut out. "Get them in and get them out," seems to be the slogan. The gullible public pays more money to see a show on these days and gets less for it.

Unlike the employes in other industries, theatre employes are not paid time and a half or double time for working week-ends and holidays. In other industries the unions demand, and this demand has been recognized, that their members be paid extra for working on holidays. A holiday is as much a holiday to a man working in a theatre as it is to a man working in a store or factory. We long have wondered why this situation has not been given more serious thought by our craft, and would like to get the opinions of our readers on this matter.

● Arthur J. Payette, secretary-treasurer of Local No. 186, Springfield, Mass., informs us that the War Labor Board approved his local's request for a $3 per week increase for each member and a one-week's vacation with pay. The vacation clause in the new contracts now reads "One week vacation with pay after 48 weeks employment by the theatre or circuit." This has been approved in all classifications including the out-of-town houses. Contracts are to run for a period of three years and are retroactive to September 1st.

We were much impressed with Payette's praise of the Regional War Labor Board for its intelligent handling of matters placed before it. He believes that many delays in WLB approval of wage increases are due to lack of care in making out the necessary forms and to insufficient information regarding a particular situation.

"We filed fourteen Form 10s," writes Payette, "and to date twelve of them have been approved. On November first we filed eight Form 10s with our Local Wages and Hours Office. These forms were forwarded to the Wage Stabilization Office in Boston, where they were approved and returned to Springfield within eleven days. Another two forms were approved and returned in ten days, and two more in eight days."

● Our secret agents advise us that Harry A. Barco, business agent of St. Louis Local No. 143, who prides himself on his prowess as a hunter of wild game, is patting himself on the back these days for an unusually fine kill on his recent deer-hunting trip in Colorado. Barco claims to have shot a two-point buck and despite the fact that he brought his prize home to substantiate his claim, persistent rumors are floating around St. Louis that his shot really hit a mule and that the dead buck was picked up somewhere on the road. Latest reports indicate that our good friend Harry is still sticking to his story.

Harry A. Barco

● Bill Estes, member of Local No. 249, Dallas, Texas, is mighty proud of his son, Lt. Randal "Bill" Estes, Jr. Young Estes is a pilot stationed at the Laredo Army Air Base and is eagerly looking forward to taking an active part in the Pacific conflict. If he is a chip off the old block, it wouldn't surprise us to see his coming home with Tojo's scalp dangling from his belt.

● George Raaflub, secretary of Syracuse Local No. 376, reports the loss of another member in the death of Joseph L. Cecile, who recently passed on after a lingering illness. Cecile was born in Canada about 56 years ago and joined Local 376 in 1916. A son, Earle, also a member of the local, is now serving overseas with our armed forces.

● The members of Local No. 348, Vancouver, working in independent houses, were granted an increase of 10c per hour. The independent theatre owners in face of the boom they are now enjoying, appealed to the National Board and, we are happy to state, this appeal was rejected. Might just as well get set, boys, for the day when they will put on their famous crying act and pull the old line about taking a "temporary" cut—just to tide them over a seasonal slump. They expect you to share in their trials and tribulations but not in their prosperity.

● R. W. Greer, Local No. 386, Columbus, Ohio, is the newly elected president of the Ohio State Association of Projectionists and Stage Hands. Herbert Schell, Columbus Local 386; John Shuff, Akron Local 364; Albert Miller, Canton Local 671; H. M. McCrone, Ashtabula Local 422, and Charlie Ring, Cincinnati Local 327, were elected vice-presidents. Robert Mills of Local 352, Springfield, is the new secretary.

● Last month we mentioned that Solly Pernick, business agent of New York Stage Hands Local No. 1, was granted a leave of absence from his local union duties to tour the European battlefronts with an USO unit of the hit show, "Oklahoma."

As a tribute to his popularity in the industry, Solly was tendered two testimonial dinners. Several hundred people attended the first party and many of Solly's friends from all parts of the country gathered to wish him Godspeed.

Among the guests of honor in attendance were I. A. Pres. Walsh, Sec.-Treas. Krouse, and Assistant I. A. Pres. Raoul. Other guests were I. A. Representative J. B. Fitzgerald and William Finegan, both of Local No. 27, Cleveland, Ohio; Arthur Martens and Dick Hayes, Westchester Local No. 650; Tom Murtha, Brooklyn Local No. 4; Frank Olsen and Larry Cassidy, Chicago Local No. 2, and all the officers of the various New York City I. A. locals. Also, New York City License Commissioner Paul Moss; Ed Sullivan, the noted columnist; Brock Pemberton, well-known theatrical producer; James Reilly, secretary of the League of N. Y. Theatres; Jack Rosenberg and William Feinberg of the musicians' union.

The second party was a more intimate affair and was attended chiefly by members of Pernick's own local, No. 1. A committee consisting of Myles McCarthy, Joe Sinclari, Sam Grotsky, Gene Knox and Tony Grasso presented Solly with a 17-jewel solid gold stop watch.

● The WLB has approved a wage increase of a flat 15c per hour for the members of Local No. 150, Los Angeles, Calif., retroactive to July 1, 1943. Not bad, eh?

● About twelve billion dollars in war bonds, or approximately one-third of all war bonds sold in this country, have been purchased by members of labor unions, according to a statement issued by James L. Houghteling, director of Labor relations for the Treasury Department.

● If you have postponed the purchase of war bonds in the 6th War Loan drive, read what Gene Atkinson, business agent of Chicago Local No. 110, has to say on the subject. "Visit any Veteran Hospital," says Gene, "where the maimed and blinded young fighters of the war are trying to return to life. Walk through the aisles in the wards and see the pale faces, haggard eyes and empty sleeves, the limbs suspended on pulleys. You'll get a lump in your throat that will make up your mind for you to take an active part in some war work—or make some sacrifice." Atkinson, who suits action to the word, has pledged Local 110 to buy $200,000 in bonds in the 6th War Loan drive.

Gene Atkinson

● "Out of sight—out of mind" does not apply to most I. A. locals whose members are serving with the armed forces here and overseas. This fact is borne out by the many letters we receive from the men telling of their appreciation of the gift packages sent to them from time to time by their locals. We have a letter on our desk from Lt. Merle Chamberlin, member of Hollywood Local No. 165 and now with the Signal Corps somewhere in Europe, in which he writes of his appreciation of the package of snacks he received from his local.

● **President Walsh has called the I. A. executive board for its mid-winter session which will be opened January 15 next at the Nicollet Hotel in Minneapolis, Minn.**

● Adolph Goodman, genial assistant manager of RCA Service Company, recently became the father of a third girl, Regina Judith. Although the newcomer is very welcome at the Goodman menage, Adolph hasn't given up hopes of hitting the jackpot with a battling boy.

● Many I. A. locals within the last few months have been successful in negotiations for wage increases plus vacations with pay for their members. This is a real sign of progress. We hope it won't be very long when the "vacations with pay" clause will be found in *every* I. A. contract.

● We received a copy of "Photographed . . . by" a monthly bulletin issued by the International Photographers of the Motion Picture Industries, I. A. Local No. 644. It is written in a breezy informal style and concerns itself with local union matters and the activities of its members. Jay Rescher, secretary of the local and editor of the bulletin, is to be commended for turning out a neat job.

● Recent visitors to the offices of I. P. from St. Louis Local No. 143 were Harvard O'Loughlin, president; Leo Canavan, vice-president, and Harry G. Witte, executive board member, who spent several days in New York attending to union matters. We enjoyed a couple of hearty laughs when Harvard related his experiences on a Fifth Avenue bus. Have him tell you the story of "stolen moments."

● According to a statement recently issued by the National Fire Protective Association 1,400 theatre fires were reported for the year 1943, with a property damage estimated at $4,600,000. This figure does not include unreported projection room fires—fires that are extinguished by alert and quick-thinking projectionists, often at the risk of their own personal safety.

It seems to take a catastrophe, like the Boston Cocoanut Grove disaster of several years ago, to shake the industry out of its lethargy and make it "fire-conscious." Unfortunately, however, after a little flurry of activity, all interest dies down and nothing more is heard about greater protection of patrons and employes of theatres against fire hazards. That is, until the next holocaust.

We were very much interested in a statement made by S. S. Wright, provincial fire marshal of Nova Scotia, in which he said that many theatres now in operation are definitely hazardous. He pointed out that many projectionists are under the impression their projection rooms are fire-proof "because they have walls made of a thin sheet of asbestos and steel —they have nothing of the kind." Mr. Wright is preparing a list of recommendations which, if adopted, he believes will eliminate many of the existing fire hazards in theatres. This is all very fine as far as it goes, but what we would like to know is just what steps will the fire marshal take to enforce these recommendations?

● Business agents of local unions are eligible for gasoline, says Leo F. Lucas, Liaison Officer of the OPA, representing the A.F.L. If you want further information on this subject, contact Lucas at the A.F.L. office in Washington.

25-30 Club Notes

HONORARY membership cards in the 25-30 Club were awarded to the following prominent personages in the industry: Dr. Alfred N. Goldsmith, noted scientist and well-known consulting engineer in the electrical arts, and past president of the Society of Motion Picture Engineers; Father Robert A. Boelcke, chief of the Science Department of St. Mary's College, Penna.; Harold Williams and Gus Durkin, remembered for their ability as labor leaders in our struggle for existence many years ago, and Robert Goldblatt, who was instrumental in obtaining the charter for Local No. 306. Goldblatt represented the Auxiliary of Local No. 35 at the 1910-11-12 I. A. conventions.

Dr. A. N. Goldsmith

Father Boelcke was unable to attend the meeting but he sent a letter of acceptance which was read at the meeting. Incidentally, he sent the members a box of cigars which was very much appreciated.

Applications for membership were received from the following: Bert Bell, business agent of Locals 112, 380 and B-59 of Oklahoma City, as well as secretary of the 15th I. A. District; Abraham Katz, secretary of Local 384, Hudson County, N. J.; Herman Gelber, president of New York City Local No. 306; Edward Simon, Local 306, and the following members of Syracuse Local No. 376—Lionel B. Wilcox, treasurer, Raymond Roe, business agent, William Doss and Louis Boyd.

THE EFFECT OF LAMP FILAMENT

By *M. G. TOWNSLEY*
BELL AND HOWELL COMPANY

Data are given on the effect of filament shift and filament rotation on the screen brightness and brightness uniformity in a high-efficiency 16-mm projection optical system. The data show that the filament location and orientation are critical for maximum brightness and best uniformity. The precision illumination-testing projection equipment used in making these tests is described.

IN 16-mm projection it is desirable that the screen brightness be as uniform as possible, and that the total screen illumination be as high as possible. Important among the many factors which contribute to the screen brightness and the brightness uniformity are the condenser design, the projection lens design, and the location and size of the lamp filament.

Mili and Cook[1] have shown that properly designed aspheric condensers contribute materially to the screen brightness and screen uniformity. The commercial difficulty of fabricating aspheric condensers has prevented their wide commercial use although some commercial 16-mm projectors are equipped with aspheric condensers.

Comparatively few data are available on the effect of the filament position on the screen brightness and brightness uniformity. It is the purpose of this article to present the results of studies made in the laboratories of the Bell and Howell Company on the effect of the filament location.

The filament alignment in a projection lamp is not under the control of the user so that the conclusions drawn from the present investigations will be an indication of the allowable filament location tolerance in the lamp base and lamp socket construction.

The condensed system in a 16-mm projector images the filament at a point usually within the projection lens and passes substantially all of the light which emanates from the condenser through a rather sharply defined circle at the position of the aperture plate. The *maximum* condenser efficiency is obtained when the filament image approximately fills the projection lens aperture, and the aperture illumination circle is as small as is possible with complete coverage of the aperture. It is also necessary that the maximum possible solid angle be subtended by the entrance pupil of the condenser.

Lateral shifting of the filament shifts the image of the filament within the projection lens so that it no longer properly fills the projection lens, resulting in loss of light and uneven illumination in the projector aperture.

† *J. Soc. Mot. Pic. Eng., July 1944.*

Spherical Reflectors

All 16-mm projectors are equipped with a spherical reflector behind the projector lamp which forms an image of the lamp filament in the plane of the filament itself. This image returns a considerable quantity of energy to the filament plane and results in additional heating of the filament and higher filament efficiency. Lateral shifting of the filament causes this reflected image to shift in the opposite direction, decreasing the overlap of the filament and image, and lowering the filament efficiency.

The first set of tests was conducted to determine the effect of shifting the filament laterally. A 750-w, 100-v, 25-hr lamp was used with a high-efficiency condenser and a 2-in. *f*/1.6 projection lens. The condenser used is equivalent to the most efficient condenser used by Bell and Howell in a commercial projection. The lamp was operated at its rated voltage throughout the testing procedure.

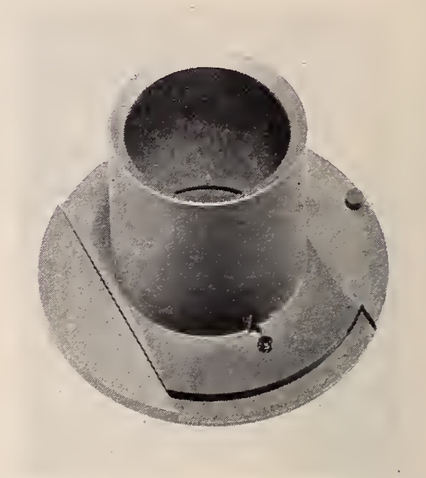


FIGURE 2. ***Lamp base used for testing projection optical and illumination systems.***

The equipment used in performing these tests is the projection optical testing bench which was developed for the purpose of testing projection optical and illumination systems in this laboratory. The entire unit is mounted on a large optical bench and consists of a lamp house, which is equipped with a precision socket adapted to take a large lamp mounting flange; a movable condenser holder, which will accept any condenser diameter and may be moved longitudinally to position the condenser at the proper relation to the lamp; and a movable aperture plate and lens holder, which may be moved longitudinally with relation to the condenser mount and lamp housing. This complete unit forms a flexible projection optical system which may be set up to simulate the optical system used in any desired projector.

The optical bench is equipped with a saturated iron constant voltage transformer which maintains the voltage output constant within 0.1 volt for a line voltage fluctuation of several volts. This effectively maintains the constant voltage on the lamp which is essential to proper testing. Various voltages for testing with lamps of differing design voltages may be obtained by feeding the output of the constant voltage transformer into a tapped auto-transformer from which any output voltage from 15

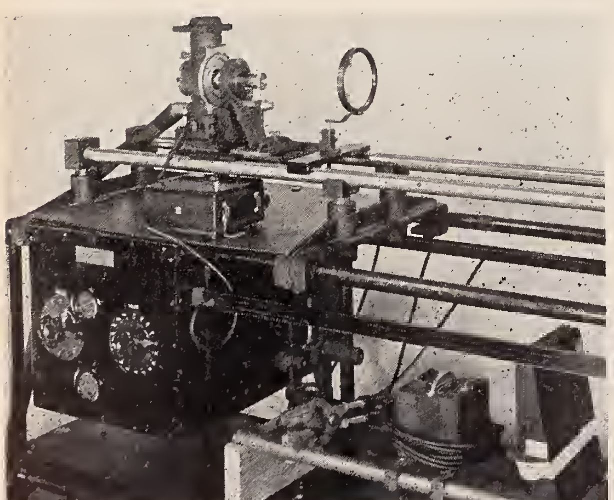


FIGURE 1.

Construction and arrangement of lamp testing equipment.

POSITION ON PROJECTION SCREEN BRIGHTNESS UNIFORMITY†

volts to 130 volts may be selected in steps of one volt.

Voltmeter connections are made directly at the lamp socket so that the voltage supplied to the lamps may be read without the inclusion of any line drop. Large flanged brass rings are provided into which the lamp is soldered in a special positioning fixture which projects both face and edge views of the filament on a graduated screen so that the filament may be properly located with respect to the base laterally, vertically, rotationally, and longitudinally along the optical axis.

When the lamp is thus positioned, it is soldered into the brass flange and the entire lamp and flange assembly is then ready for transfer to the projector lamphouse. The flange diameter is maintained to fit the lamp socket. The flange is provided with a pin which engages a slot in the lamp socket to hold the lamp in rotational alignment. With this arrangement, it is possible to position the lamp filament with respect to the projector optical axis within a tolerance of ±0.005 in. and a rotational tolerance of approximately one degree.

Special Lamp Socket

For the purpose of this test, a special lamp socket was constructed having a lateral slide so that the lamp could be shifted laterally, the amount of shift being measured by a depth micrometer. The rotational adjustment of the lamp filament position was made by attaching a protractor to the lamp, unsoldering the lamp in the ring, and rotating the lamp through the desired angle.

TABLE I

750-w, 100-v, Westinghouse 25-hr. Lamp, 8C-1A Condenser. Operated at 100 volts, 2-in. f/1.6 Projection Lens, 18-in. Screen Image.

	1a Illumination in Foot Candles			***1b*** Per Cent of Maximum Illumination		
	L	C	R			
Lamp Centered	220	260	210	81.48	96.29	77.77
	225	270	225	83.33	100.00	83.33
	200	250	207	74.07	92.59	76.66
0.020 Off Center	190	235	220	71.69	88.67	83.01
	185	265	235	69.81	100.00	88.67
	175	235	210	66.03	88.67	79.24
0.040 Off Center	168	233	212	67.20	93.20	84.80
	178	250	220	71.20	100.00	88.00
	157	220	200	62.80	88.00	80.00
0.060 Off Center	145	220	220	60.41	91.66	91.66
	148	240	235	61.66	100.00	97.91
	132	210	210	55.00	87.50	87.50
0.076 Off Center	145	200	204	63.04	86.95	88.69
	155	225	230	67.39	97.82	100.00
	148	210	210	64.34	91.30	91.30

Figure 1 shows the general arrangement and construction of the lamp testing equipment described, and Figure 2 shows the lamp base which was used for these tests.

A standard 16-mm aperture was projected to a screen width of 18 inches. Screen illumination readings were made with a Weston Model 603 photometer at 9 positions on the screen: 4 corners, the center of each edge, and the center of the screen. The reference position was the position in which the lamp filament planes were parallel to the film gate and the center of the filament was on a line perpendicular to the film gate and passing through the center of the aperture.

Referring to Table I, 1*a* gives the illumination readings at the 9 chosen positions for the lamp on center, 0.020 off center, 0.040 off center, 0.060 off center, and 0.076 off center. Again referring to Table I, 1*b* gives corresponding readings converted to per cent of the maximum reading on the screen. It will be observed that there is a progressive decrease in screen uniformity as the lamp is moved laterally. This is most clearly seen in 1*b* of the table, where the lowest corner reading decreases from 74.07 per

(*Continued on page* 26)

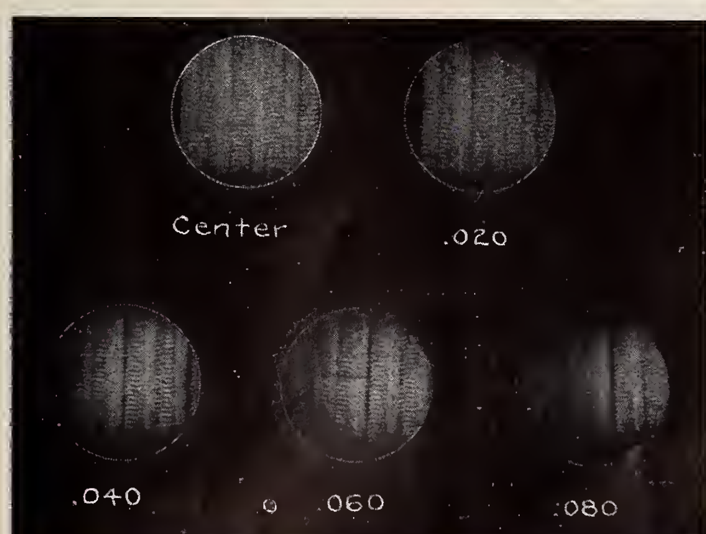


FIGURE 3. *Progressive stages of lateral shift of filament image.*

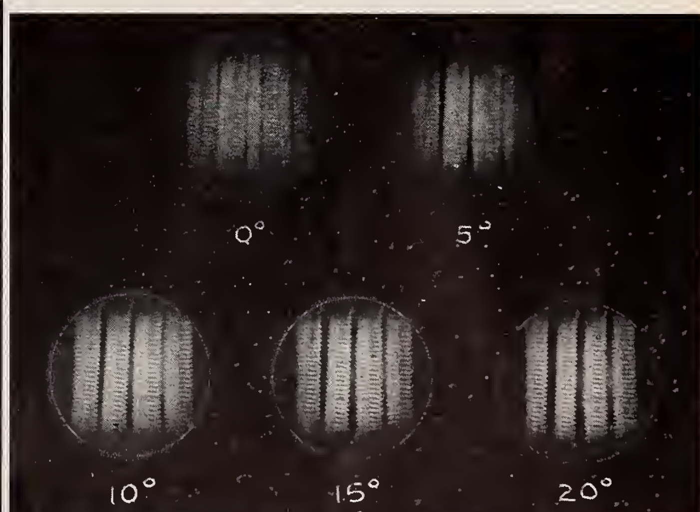


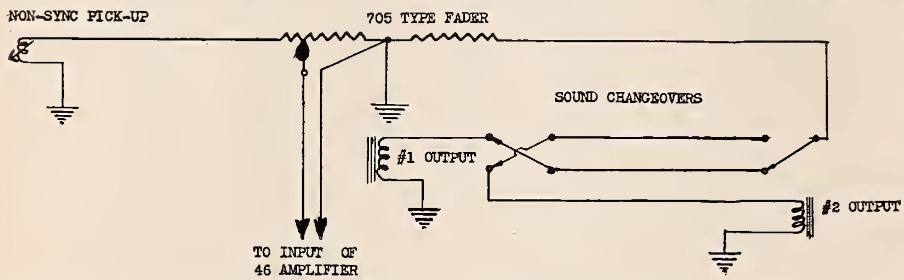
FIGURE 4. *Filament appearance when rotated from the reference position by successive steps.*

IP AT YOUR SERVICE

This department is a collection of random thoughts and some not so random: fact, fancy and opinion relating to the man behind the man behind the gun—the serviceman. The prime purpose of this section is to promote a closer relationship between serviceman and projectionist based on a better understanding of their mutual problems through an exchange of news and views, kinks and kicks. To this end, contributions relative to any phase of the serviceman's activities are invited.

Simplification of Wiring on W. E. 46-Type System

In making a recent re-installation of a W. E. 3A46 battery operated system a considerable reduction in conduit sizes in wiring was effected by simplifying the wiring. The space condition made it practical and simple to mount the 46-type



amplifier between the machines, and shielded leads were kept to a minimum. The fader system (see diagram) was connected in a manner that has proven very convenient.

The red side is used for both machines and the white side of the fader is used for the non-sync only. Fading is accomplished by a four-way and a three-way switch, as shown in the wiring schematic above.—A. F. SCHNEIDER, *RCA*.

Conservation of Arc Lamp Mirrors

A case of reflector cracking and its cure was recently worked out in one of my theatres where the projection angle is quite steep. The projectionist informed me that shortly after installation of the projection equipment both reflectors cracked at the point where the upper retaining tab contacts the glass, the crack extending to the center hole. Replacement of this unit resulted in the same condition occurring in the new mirrors. Experimental rotation of the reflector approximately one inch in its frame caused another crack to appear at the same point.

This condition was corrected by removing the upper retaining tab and installing one at each side of the frame leaving the relative heat dissipation and absorption characteristics of glass vs. metal to those in the know about such things. For all mechanical purposes the correction gave the desired results.—F. M. WALLS, *RCA*

Emergency Substitute for Ballast Tube

In answering an emergency call at a theatre using the small W. E. equipment having a 119-A ballast tube that failed to function, I found that the spare tube had been broken. As an emergency substitute in such a case either a W. E. 274 rectifier or an RCA 5Z3 could be used equally as well. Tubes of this type having four pins and a filament current of about 1½ amperes can be used for this purpose, although a slight readjustment or resistors may have to be made. —H. R. DAVIDSON, *RCA*

Correcting Amplifier Trouble in W. E. System

An unusual form of trouble was encountered in a W. E. 49 amplifier, the cause of which was obscured because it seemed to be confined to one amplifier. Either poor quality, low output, motorboating, or all these conditions may be found in one amplifier, while the other 49 amplifier operates normally. Disconnecting the PEC or output leads does not clear the trouble, which usually is located in the D96101 filter which supplies the plus 90 volt to each 49 amplifier.

Temporary correction may be made by installing new capacitors in the D96101 cabinet. In an emergency an 8 or 10 microfarad capacitor from ground to the plus 90 volt terminal of the 49 amplifier will also correct the trouble.

Occasionally this type trouble may be identified by a high pitched whistle or oscillation, usually starting at a fader setter of 8 or higher.—E. J. DULLEA, *RCA*

Cleaning Optical Systems

I carry a small clip-on screwdriver fitted with a short length of radio spaghetti. This is handy for use in cleaning the front element of opticals. Pull the spaghetti up so that it covers the driver end and wrap it with a clean handkerchief or cleansing tissue. There is no possible chance of scratching the lens.—M. E. RUSHWORTH, *RCA*

Measuring Rectifier Current

A useful and easily made adjunct is a series cut-in for reading amperage of the side contact rectifier tubes. Two small bits of thin copper about one inch by one-half inch with a short wire soldered to a tab at one end are separated by a piece of mica somewhat larger than the copper. The whole is fastened together with tar tape. Two clips on the ends of the wires clip on to the test leads. The clip is then inserted between the socket and the side contact of the rectifier tube.—M. RUSHWORTH, *RCA*.

Locating A. C. Hum

Except where a hum exists inherently in the amplifier system, measure the common side of the a.c. supply and if a voltage exists to ground, tighten all connections on the buss strip. This hum condition usually can be identified by increasing the load on the line. The amplitude of the hum will vary with the load.—R. L. STRAWICK, *RCA*

Ideal Commutator Dresser

Made by the Ideal Commutator Dresser Co., is a pencil type, finish grade, standard size Ideal commutator resurfacer that sells for about 75c. This tool is a non-conductor and can be used on most of our commutators with the brushes in or out (preferably out) with excellent results. In many cases, where the commutator is not cut too much it is possible to get a smoother finish than can be obtained with a lathe tool. This latter statement is made considering the long motor shafts with the spring that usually causes some chatter, and if the length of the shaft does not cause it the condition of the bed plates on most lathes will bring it on.

This tool has been used in the territory for several years and during that time it has been necessary to actually remove for lathe cutting a very small

(*Continued on page* 25)

WIRING DIAGRAMS

(*Continued from page* 10)

amplifier tube, and the transformer to which its plate is connected must be an output transformer. Such considerations (which, of course, become more complex in larger apparatus, as will be seen) enable the projectionist to determine the functions of the major parts, and to arrange them in his drawing according to custom.

Plenty of space should be left between them for insertion of the minor par symbols.

Custom is followed in Figure 5 where the input tube is shown at the left and the output tube at the right. There are, however, no internal power supplies, and no transformers. The tubes, therefore, are the only major parts in Figure 5 and as soon as they have been drawn the projectionist proceeds to step three—the insertion of minor parts.

Here also custom rules—for example, the grid bias resistors (R-3, R-5 of Figure 5) are always drawn under the cathode; plate load resistors (R-9, R-10) are always shown to the right of the tube, etc. In determining which parts perform what functions the projectionist traces connections in his wiring diagram. He may check the results thus obtained by sketching little partial schematics on a separate piece of paper; and also, and this is most important, by consulting the apparatus information as given on the wiring diagram or in its accompanying tabulation.

In the course of this second step the projectionist scrambles in parts of the third step. If he is going to draw R-3 (Figure 5) under the cathode of VT-1, he might as well put in the short connecting wire at the same time; similarly with R-9 and the plate of VT-1. On the other hand, the relationship between R-10 and the plate of VT-2 may or may not seem more difficult to the projectionist because of the presence of L-1, R-11, and C-9. The projectionist may then simply draw in those parts, making no attempt to connect them up until he is ready for step four.

When step three is undertaken and connections are drawn in (tracing them according to the wiring diagram) it may be found that some of the minor parts—and perhaps some of the major parts—have not been so located as to produce the clearest possible drawing. They should then be erased and re-drawn elsewhere. This amounts to undoing part of step two in order to scramble it in with step three, which frequently will be found necessary in order to get the simplest possible final drawing.

Step four, as already noted, will have been extensively scrambled with the

PROUD MARKS 35 YEARS WITH WESTERN ELECTRIC

November 15 marked 35 years of service with the Western Electric Co. by George B. Proud, treasurer. Mr. Proud, in his present capacity, guides the nation-wide financial and credit functions of the organization, which last year produced almost $600,000,000 worth of communications equipment for the armed forces and our allies in addition to $118,000,000 of equipment for the Bell System.

His first connection with Western Electric was in 1909 as an auditor, and from that time until his appointment as general auditor in 1918 he carried out several auditing and financial assignments. From 1928 until his appointment as treasurer in 1941 he served as assistant comptroller in charge of financial forecasts and statistics.

PARTS SHORTAGE LITTLE AIDED BY ELECTRONICS RELEASE

It is doubtful whether release of a large stock of electronic components by the War Production Board will ease the shortage situation in sound equipment parts, according to industry opinion. Types released are not in general use to producers of 35-mm sound systems, it is pointed out. In the release are included capacitors, microphones, speakers and other parts which are to be made available for civilian use or for export. Electronic parts for 35-mm sound systems are still in the critical category, with the industry extremely anxious for assistance from WPB for new production.

AL POLLACK JOINS RCA

Al Pollack has been added to the staff of the theatre equipment section of the RCA Victor Division, Radio Corporation of America, at Camden, N. J. Mr. Pollack, well known to motion picture exhibitors for the past 25 years, will become product man in charge of rectifiers and generators, according to Homer B. Snook, manager of theatre equipment sales.

Mr. Pollack's career in the theatre equipment field began in 1919 with the Minusa Cine Screen Co., St. Louis, where he became assistant manager in 1922. Four years later he was made vice president and general manager of the American Silver Sheet Co. and in 1929, when the two firms merged with the Walker Screen Co., he became vice president in charge of sales of the resulting Walker American Corporation.

He left the latter organization in 1935 and began operating as a manufacturers' agent, and in this work was responsible for obtaining the best distributors in each film territory for products he represented. At the same time he maintained close personal contact with distributors to obtain maximum sales. He represented Automatic Devices Co. and Baldor Electric Co. until he became associated with RCA.

(Continued from preceding page)

others because as the parts are put in, and as the wires are drawn in, it is natural and easiest to add their identification at the same time. Let us look at Figure 3 again. It will be natural and easy, as the amplifier tube symbol is drawn, to add V-1 for identification. But it would be less desirable to stop in order to add "205-D Vacuum Tube." That kind of information can very well be left for step four.

It may be well to avoid any possible confusion to the reader by repeating at this time:

The process of making the *wiring* diagram can be considered as consisting of five steps: (1) making the apparatus layout; (2) adding terminals to the apparatus (points to sockets, etc.); (3) adding parts information; (4) drawing in connecting wires, and (5) adding wire information.

The process of making the *schematic* diagram can be considered as consisting of four steps: (1) making parts layout of major parts; (2) adding minor parts; (3) drawing connecting wires, and (4) adding miscellaneous information.

The four steps involved in making the schematic may be scrambled to a considerable extent, as circumstances indicate. The five steps involved in making the wiring drawing should be kept separate as far as possible, because of the greater chance of confusion and resultant errors.

As will be seen in a subsequent article making a wiring diagram of an entire sound installation is still a different procedure, and can best be regarded as involving only three steps.

AT YOUR SERVICE

(*Continued from page* 22)

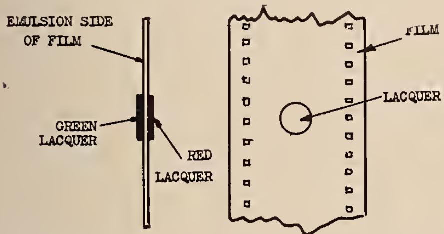
percentage of commutators. The same company also furnishes a larger and wider tool with a handle for arc generator commutators which permits the resurfacing of these machines without removing them from the projection room. —M. F. HARROD, *ALTEC*

Reducing Vibration Transmission From Motors, etc.

I have just observed the installation of a new arc generator mounted on a ½″ thick rubbery composition which I am told is called Keldur. This stuff appears to do a remarkable job in reducing vibration transmission—F. J. PFEIFF, *ALTEC*

Identifying Emulsion Side of Test Film

In making test loops and running frequency response film, I find the following a very easy method of identifying the emulsion side of the film. At the time that the loop is made up or when the film is received, a small spot of green lacquer is placed on the emulsion side of the film, then as the film is transparent and this would show from either side, a spot of red lacquer is placed on



the reverse side directly over the green. Be sure that the green spot is on the correct side, so that when the loop is accidently turned over the fact may be shown instantly by the red spot.—K. E. STEPHENSON, *RCA*

How to Keep Dust from Lens

Cut the top and bottom out of a vegetable can, leaving the flange on both ends. Remove sharp edges and paint dull black. Cut a cardboard shim to fit can to objective lens. You will find this an excellent device for keeping lens from dust. (Oh, yes, remove vegetables from can.)—J. A. DAY, *ALTEC*

Preventing Damage to Film

In checking complaints of film being damaged by the holdback sprocket when the lower loop is lost in the soundhead (and this condition occurs very often when running old film), I have found that it is possible to install the holdback sprocket in such a manner that if the loop is lost between the constant speed and holdback sprockets, the film will be drawn tight across the teeth of the holdback sprocket by the take-up tension in such a manner that the film between the sprocket holes will be damaged or the sprocket holes strained.

To correct this condition, check the relation of the sprocket teeth to that of the sprocket holes in the film when drawn tight across the holdback sprocket as it would be if the lower loop had been lost. If the holes in the film do not fall freely over the teeth of the holdback sprocket, loosen the set screw in the sprocket and rotate it on the shaft until the holes and sprocket teeth coincide. The film will now run without damage when the lower loop is lost. This adjustment also can be made so that operation can continue without damage to the film when

(*Continued on page* 30)

EFFECT LAMP FILAMENT

(*Continued from page* 21)

cent for the center position to 55 per cent for the 0.060 off center position. There is an apparent gain in screen uniformity for the position where the filament is 0.076 off center, but this is offset by the fact that the maximum brightness on the screen has decreased from 270 ft-c to 230 ft-c. It is not considered desirable that the screen illumination at any corner drops below approximately 70 per cent of the illumination at the center of the screen. On this basis, it appears that a lateral shift of 0.020 is more than can be tolerated with this condenser design.

Photographs were made of the filament image at the various settings to show the filling of the projection lens by the filament image. Figure 3 shows the progressive stages of lateral shift. At 0.040 the lateral shift has become sufficient so that the reflected image has shifted noticeably from behind the filament. At 0.060 the shift has become sufficient so that more than one-third of the filament image is outside of the lens covering circle, while at a lateral shift of 0.076 only about one-half of the filament is being utilized.

The second set of tests was made to determine the effect of rotary motion of the filament about a vertical axis on the uniformity of screen illumination. The tests were made in the same way as the tests for lateral shift except that a 115-volt lamp was used. The lamp was rotated about its vertical axis passing

TABLE II

750-w, 115-v, Westinghouse 25-hr. Lamp, 8C-1A Condenser. Operated at 115 volts, 2-in f/1.6 Projection Lens, 18-in. Screen Image.

Position of Lamp	*2a* Illumination in Foot Candles L	C	R	*2b* Per Cent of Maximum Illumination		
Lamp Centered	**231**	**290**	**256**	**75.4**	**94.7**	**83.6**
	257	**306**	**260**	**83.9**	**100.0**	**84.9**
	226	**272**	**231**	**73.8**	**88.8**	**75.4**
5 Deg. Rotation	**200**	**279**	**265**	**66.4**	**92.6**	**88.0**
	220	**301**	**274**	**73.0**	**100.0**	**89.5**
	200	**270**	**245**	**66.4**	**89.7**	**91.0**
10 Deg. Rotation	**190**	**258**	**270**	**65.5**	**88.9**	**93.10**
	201	**290**	**282**	**69.3**	**100.0**	**97.2**
	184	**250**	**253**	**63.4**	**87.2**	**87.24**
15 Deg. Rotation	**178**	**242**	**260**	**61.37**	**83.44**	**89.65**
	192	**265**	**290**	**66.20**	**91.37**	**100.00**
	170	**230**	**253**	**58.6**	**79.31**	**87.24**
20 Deg. Rotation	**186**	**220**	**256**	**65.72**	**77.73**	**90.45**
	200	**241**	**283**	**70.67**	**85.15**	**100.00**
	170	**210**	**243**	**60.07**	**74.20**	**85.86**

through the center of the filament. Measurements were made at the reference position with the filament plane parallel to the aperture plate and the filament rotated 10, 15, and 20 degrees. In Table II, 2*a* shows the effect of the rotation on the screen illumination readings. Two effects are apparent from 2*a* and 2*b* which show the same values converted to percentage readings. The maximum screen brightness decreases as the filament is rotated from the reference position, and the screen uniformity becomes progressively poorer as the rotation increases.

At the reference setting, the lowest corner brightness was 73.8 per cent of the center brightness, and the center brightness was 306 ft-c. Five degrees rotation causes a 2 per cent decrease in center brightness and a decrease from 73.8 per cent to 66.4 per cent in corner-to-center ratio. This effect becomes worse as the rotation is increased and it appears that approximately 5 degrees is the maximum allowable rotation of the filament plane from the best or reference position.

The photographs of Figure 4 show the filament appearance as it is rotated from the reference position by successive steps. These photographs show graphically the reason for the decrease in screen illumination due to masking of the filament coils as the filament is rotated. The

(*Continued on following page*)

WESTERN ELECTRIC OBSERVES 75th ANNIVERSARY

Western Electric Co. last month observed its 75th anniversary, with nearly 100,000 men and women, comprising its nationwide family, aiding in the celebration of the organization, which is the manufacturing, purchasing and supply unit of the Bell System. During World War 2 it has become the nation's largest producer of communications and electronic equipment for the armed forces.

Employes in key cities, as part of the observance, pre-viewed a feature length motion picture, "Heritage for Victory," which dramatizes the growth of the organization over three-quarters of a century and demonstrates how the cumulative skill, technique and experience gained through 75 years have made it possible for Western Electric to meet the great challenge this war has imposed upon it.

The picture was specially produced in Hollywood by Wilding Pictures Productions, Inc., for showing to employes of the company. It is considered, superficially, the story of Western Electric, but its theme transcends the work of a single organization. It is, in a broader sense, the story of American faith and determination on the job on all fronts which spell certain victory.

(*Continued from preceding page*)

photographs do not clearly show the reason for the decrease in brightness at the center as compared to the brightness at one edge of the screen. This is partially explained by the closer approach of one edge of the filament to the condenser and by the rotation of the reflected image in a direction opposite from the rotation of the filament, so that the filament image is formed in a progressively differing relation to the filament itself, thus resulting in a change in the efficiency of the reheating process. At no time does the maximum screen brightness reach the brightness of the center of the screen with the filament in the reference position.

Although the data given here represents the results of tests on one lamp and condenser combination, they confirm and represent a great mass of similar tests made on other condenser and lamp combinations. The present lamp and condenser combinations were selected as being representative of excellent commercial practice.

From the data given, it is possible to make a tentative selection of lamp position tolerance for any given criterion of the screen brightness ratio and acceptable decrease from maximum possible screen brightness. It is apparent from the data that for an efficient condensing system, the lamp filament position tolerance will be small.

REFERENCE

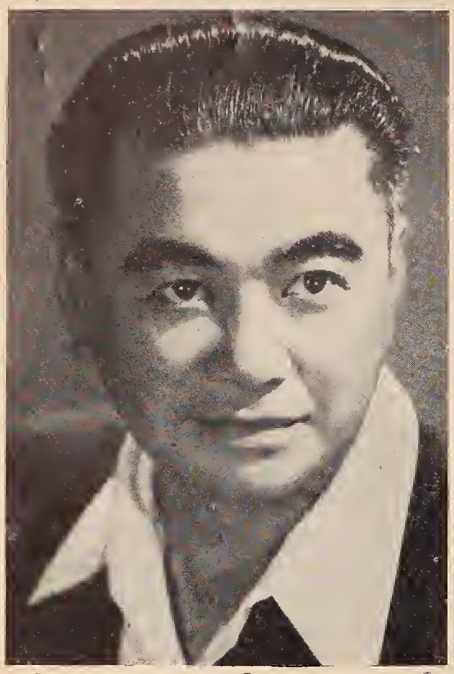
1 MILI, G., and COOK, A. A., "Condensers for 16-mm Optical Systems," *J. Soc. Mot. Pic. Eng., June* 1936.

RCA THEATRE EQUIPMENT ADDS BALDOR RECTIFIERS

The theatre equipment section of the RCA Victor Division, Radio Corporation of America, hereafter will handle distribution of the Rect-O-Lite tube-type rectifier manufactured by the Baldor Electric Co., St. Louis, it is announced by G. A. Schock, head of the apparatus division of Baldor.

Rect-O-Lite rectifiers will be available in increasing quantities in a few months under provisions of the War Production Board's order L-325, Mr. Schock said, adding that "the distribution agreement just concluded with RCA anticipates this increase in availability, as well as the vast deferred requirements which must be met when normal peacetime output is resumed.

Presenting: W. Young Louis



W. YOUNG LOUIS, charter member and president and business manager of I. A. Local No. 762, San Luis Obispo, Calif., is a man of many parts, has a distinguished career, but at present is devoting the major part of his time to the work he loves best—projection.

Affectionately and widely known as "Cholly," he has followed in the amazing footsteps of his father who made history in California and who died in 1936 at the age of 98, one of the country's most respected and beloved citizens.

W. Young Louis was born in San Luis Obispo on October 15, 1895, and was educated in his natal city's public schools, later taking a correspondence course in commercial law. This was followed by a special course in electrical engineering at the California Polytechnic College, from which he graduated in 1923.

After a youthful interlude of selling newspapers, Cholly in 1908 established the only commercial bill posting business in San Luis Obispo, numbering as his customers road shows and national advertisers. This business was expanded to the point where he hired stage hands and extras for the shows. For many years Cholly was known as the only Chinese stage manager in the country, having handled scores of big road productions and hundreds of vaudeville acts. He has received high praise for his clever work in designing and building decorative floats for pageants and parades and has won many gold and silver cups and trophies for various clubs and service organizations.

In 1916, while studying commercial law and electrical engineering, he became assistant manager of two motion picture theatres in San Luis Obispo. He learned projection the hard way—three days after his first glimpse of a projection room he had to take over and run the whole show. It was at this time that he decided that a course in electrical engineering would prove invaluable to him in his work. Today Cholly is the projection supervisor of three motion picture theatres in his city and is chief projectionist at the largest one—a new 1,100-seat ultra-modern structure.

He is reputed to be the first one to see the urgent need of a theatrical employees' union in the central California coast area, and was the leader in a movement which culminated in the granting of a charter to Local No. 762 by the IATSE. Ever since its inception, Louis has been unanimously elected to carry on two of the major offices—president and business manager.

"When victory comes," he said recently, "and when the boys return, I shall be happy to step out of the picture so that someone else may have a chance. I shall cherish my charter membership in the I. A. and the warm friendships that it has brought to me."

Active in civic affairs, he was a leader in the recently completed War Chest Drive and created and executed large scale displays for the Sixth War Loan Drive. He is a past director of the San Luis Obispo Rotary Club, a former director of the Chamber of Commerce, and was for four years State Secretary of the Polytechnic Alumni Association. Also, for three years he was president of the San Luis Obispo County Restaurant Owners' Association.

Louis possesses many talents. He excels in landscape and portrait oil painting, applied art, theatrical displays and posters, wood burning, chemistry, printing, photography, sign writing, designing exhibition booths, mobile lighting and animated displays for fairs, department store windows and interiors, and created, built and painted many sets of scenery before the advent of sound pictures.

He is married and is the father of a daughter, Elsie, who won the state spelling championship several years ago. It is interesting to note also that his wife was one of the privileged few to join the recent tour of the country by Madame Chiang Kaishek, and that his wife's younger sister, a native of California, is the madame's personal secretary.

Louis's father was a California pioneer who came to this country from Canton, China, in 1858, seeking gold and quicksilver. His father's name was Wong On, later changed to Louis by one of his employers because the Chinese name was too difficult to pronounce. An active and important character in the building of San Luis Obispo County, he was known from that time as Louis. He represented the Wong family, which recently traced its genealogy back for 139 generations.

Some time after his arrival here Louis's father took construction contracts for tunnels, and the building of the railroad over the Santa Lucia Mountains in the 1880s and 1890s, bringing in some 400 coolies for this work. He prospered and established a "Chinatown" for his customers and as headquarters for his workers. He also built much of the county's highway system and the entire Pacific Coast Railway system, a narrow gauge line of some 95 miles. Louis, Sr., retired from active business in 1923 and enjoyed a well-earned rest until his passing in 1936.

Standards for Theatre Television

By *H. GOLDIN*

TORONTO DISTRICT MANAGER, DOMINION SOUND EQUIPMENTS, LTD.

Because of the widespread interest in television, we present this article which originally appeared in the Monthly News Bulletin issued by the Dominion Sound Equipments, Ltd., Montreal, Canada.

WHEN calling on exhibitors and projectionists some of whom I have not seen for some time, invariably, sooner or later, remarks were made by them along the following lines: "I suppose your people are ready with new equipment?" . . . "I guess it won't be long before you will be installing television in the projection room," etc., etc.

Particularly interesting and amusing were the observations which resulted from Seagrams colored ads showing the back rail of a theatre and a picture reflected on the ceiling, implying that after the war, instead of pictures on the screen, the action portrayed will actually surround us.

In view of the above I felt that it might be of interest to discuss various phases of the situation.

This could be broken up into two groups. First: the effect of the introduction of television into the theatre and to the home. Second: the addition to the motion picture field of the various methods used to enhance the entertainment value of plays and films which have been tried to a considerable extent on an experimental basis, prior to the war.

1. On June 2, 1944, the Television Panel of the Radio Technical Planning Board approved a report outlining standards of transmission and frequency allocations for Nation Wide Television Service.
2. Tentative standards for theatre television have been set up for 1000 line pictures to be transmitted at 300 mc.
3. Some of the motion picture producing companies are interested in television companies. Example: Paramount purchased Allen B. Dumont Labs. and RKO organized a special department for television.

Let us assume that television broadcasts of plays and major events will be transmitted which could be picked up by theatres and reproduced on the screen.

Should the broadcasts be intended only for transmission to theatres and not for reception by the public in general (on a frequency band outside of the range of commercial receivers) a serious problem presents itself in the matter of fitting the time of broadcast with the film program in the theatre as we well know that not only does the time of performance vary considerably in each part of the country but also varies in each locality of the city.

One of the methods to overcome this problem might be by recording the signal when it is broadcast and reproducing it when it would fit in with the general program in the theatre. So far there has been no suggestion of any such equipment being available (to my knowledge).

It might be argued that the program in the theatre might be 100% television, but this brings in another serious problem that one theatre may play the program for a different period of time and the type of program may not fit with the audience for the particular period of the week.

Of course, should the program have to be repeated, the simplest way to do it would be to record it on a film and rebroadcast it afterwards, in which case there is no advantage in using television as a print of that film may just as well be sent to the theatre and the disadvantages above mentioned, eliminated. (The cost of the print will hardly justify the above-mentioned inconvenience.)

On the other hand, should television programs be broadcast for the purpose of presenting them in both the theatre and the home, their entertainment value

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will be just about as great as though a radio broadcast were reproduced.

Considering the above factors, I am inclined to think that television programs that may be available in the theatre will be used in the beginning and for some time to come on an experimental basis and only as an added attraction.

The attendance at movies may be adversely affected, particularly in instances where motion pictures are poorly presented from the point of view of poor light, sound, uncomfortable seating, lack of suitable ventilation, etc.

In order to offset the effect referred to in the last paragraph, it is my feeling that both the producers and exhibitors will take serious steps to raise the standard of entertainment to as high degrees as possible.

Amongst the first innovations that will concern us are: (a) a higher percentage of colored pictures with a greater depth of focus, and (b) addition of multiple track reproduction which will include two and probably three sets of horns in addition to some loudspeakers placed in the auditorium. Of course this will be accompanied by an increase in power, frequency extension, flutter reduction, etc., and at last, more attention paid to the acoustical conditions of the auditorium.

At a somewhat later date, attempts at third dimensional effects (visual) will be made.

From our point of view, I feel that the performance of the equipment would have to be kept to far closer tolerances and in key theatres, more frequent transmission checks and inspections may probably be necessary. In conclusion, the theatres will depend to a far greater extent on technical service than they have at any time before.

I. A. men meet at naval training base. Projectionists stationed at the Amphibious Training Base, Camp Bradford, N. O. B., Norfolk, Va., discover they are all members of the Alliance. Seated, left to right: Paul M. Harris, S2c, Local No. 650, Westchester Co., N. Y.; Ens. Leo Glenn, Local No. 150, Los Angeles, Calif.; John F. Davenport, S1c, Local No. 223, Providence, R. I. Standing: M. E. Savage, SAD3c, Local No. 514, Bellefontaine, Ohio, and Walter L. Bryan, S2c, Local No. 373, Terre Haute, Ind.

AT YOUR SERVICE

(*Continued from page* 25)

the pad roller arm breaks on the holdback sprocket.—Chas. S. Moore, *RCA*

Regulating Speed in Arc Motors

In this particular case the lamps had been working most irregularly with one of them requiring hand feeding due to the fact that the feed motor would not run fast enough with the control rheostat wide open. It was noted that both commutators were sparking badly on account of improper brush seating and the commutators were out of round. The rotors were removed and taken to a machine shop where I knew that a good turning job could be obtained.

The rotors were then re-installed in the motors and it was found that while one rotor would run satisfactorily in either lamp the other one worked poorly in both lamps. The control system was then investigated and it was found that the negative lead from the rectifier to the lamp was used to form the inductive field, acting as the stator winding for the lower pole in the motor field.

When there is no carbon current, there is no current going through this winding and the motor will run away. As the carbon current increases, the current through this winding increases, thereby increasing the field strength of this pole and making the feed motor slow down. If the current through the pole is excessive, as when the carbons are frozen, the field current in the pole becomes so strong that the motor will reverse its rotation and tend to back the carbons away.

The strength of this field is directly proportional to the current passing through the winding, which is the same as the current flowing between the carbons and is inversely proportional to the number of turns of wire around this pole. The speed of the motor is inversely proportional to the field strength of this lower pole. The relative strength of the two poles will determine the direction of the rotation. In the case of this motor, with the speed too slow, two turns were removed from the stator winding which allowed perfect motor speed regulation. Different sizes of carbons requiring different arc currents will require this method of adjustment.—C. C. Kaufman, *ALTEC*

MOVIES TO AID IN EDUCATING INDIA'S ILLITERATES

Movies will play an extensive part in a far-reaching post-war program in India to eradicate the large percentage of illiteracy of the country's masses, according to M. Akbar Fazalbhoy, managing director of the RCA Protophone Equipments, Ltd., Bombay. At a press conference at the Hotel Commodore, New York City, he detailed a far-reaching program of expansion for India's film industry, which calls for 10,000 permanent cinemas and touring units to bring films to all urban and rural sections.

IMPRISONED

UNTIL PROJECTED BY Simplex

REG. U.S. PAT. OFF.

In this can of film is the latest product of a leading Hollywood studio that will soon be playing your theatre. Into its production went endless hours of creation by top-flight script writers . . . all the ability of a great director . . . all the technique of master camera men . . . all the warm, living, human drama that the art of great stars and a superb supporting cast could pack into an hour and forty minutes of sheer entertainment.

But . . . as it sets there . . . it is just a metal can containing 10,000 feet of cold celluloid . . . lifeless . . . worthless . . . until it's PROJECTED!

Small wonder that leading showmen want the instrument which brings the magic illusion of life to this film to be the finest that precision engineering and the skilled hands of fine craftsmen can create.

That is why tonight in thousands of the country's leading theatres the show will be projected by SIMPLEX . . . the name which, through the years, has been synonymous with better projection wherever motion pictures are shown.

Since the birth of motion pictures, exhibitors have looked to our products for leadership in projection. Tomorrow — as yesterday and today — SIMPLEX equipment will continue to prove that — BETTER PROJECTION PAYS!

Simplex — IN WAR AND PEACE — THE *INTERNATIONAL* PROJECTOR

NATIONAL THEATRE SUPPLY DIVISION

COMPLETE SOUND AND VISUAL PROJECTION EQUIPMENT

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